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ABSTRACT

"Michigan's State Technology Plan (1998)" includes 21 Recommendations and 14 Belief Statements in categories ranging from incorporating technology into the curriculum and training teachers and other staff members to funding educational technology programs and establishing technical standards and a telecommunications infrastructure on which educators can rely. Contents include: Position of the State Board of Education; Introduction; History of State Technology Planning; Alignment with Other Initiatives; and Assessment of Michigan's Performance. The Belief Statements and Recommendations follow. Recommendations are provided in these areas: Equity; Technology Integration; Competency Expectations of K-12 Graduates; Training; Technology Budgets and Training; Teacher Competencies; Information Clearinghouse; Technology Staffing Levels; Supplementary Technical Support; Infrastructure Support; Technical Standards; Model Technology Plan; Technology Appropriation; Funding Flexibility; Collaboration; Statewide Purchasing and Licensing; Advocacy; Public Awareness; Administrative Communications; Electronic Learning Community; and State Technology Plan. Appendices list members of the Educational Technology Advisory Group, and recommendations citations and additional material. For each Recommendation, the following are identified: challenge; the Recommendation statement itself; rationale and implementation; resources; success; and citations. (AEF)

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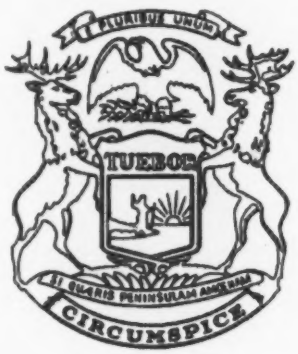

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Prepared by the
State Superintendent's
Educational Technology Advisory Group

Approved by the
Michigan State Board of Education
January 7, 1998

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Michigan Department of Education
Data and Technology Services
Post Office Box 30008
Lansing, Michigan 48909
(517) 373-6331

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EXECUTIVE SUMMARY

In providing its approval to *Michigan's State Technology Plan (1998)*, the State Board of Education reaffirms its support for the role that technology can play in furthering the educational mission and contributing to student achievement in the state. The growth in the use of voice, video and data technologies by schools in Michigan parallels the evolution of state technology plans adopted by the Board and the implementation of recommendations included in those plans by the Michigan Department of Education (MDE) and the many broad interests that represent the state's educational community. Michigan is fortunate to have so many groups and organizations that firmly believe in the potential for technology to benefit education and the state's diverse student population. The challenges and opportunities that lie ahead, to convert "potential" into reality, will require an unprecedented degree of creative leadership from educators and policymakers at all levels.

Michigan's State Technology Plan (1998) includes 21 Recommendations and more than a dozen Belief Statements in categories ranging from incorporating technology into the curriculum and training teachers and other staff members, to funding educational technology programs and establishing technical standards and a telecommunications infrastructure on which educators can rely. A fundamental recommendation on which many others depend is the creation of statewide policies that address equity of access to technology-delivered learning resources for all students, regardless of their economic status, place of residence, age, disability and other factors. Another key proposal calls on MDE and other educational interests to intensify their advocacy of technology in the learning environment.

The preceding state policy document, *Michigan's State Technology Plan (1992-1997)*, was scheduled to be revisited and updated in 1997. The pace of technological innovation in education is rapid, as evidenced by the increasing power of the Internet. The state's guiding policy document that supports the application of technology in education must reflect the many electronic learning tools, such as high-speed multimedia computers and interactive video classrooms, used by schools today. Further, it is imperative that Michigan has a state technology plan that is in compliance with requirements of funding initiatives of the federal government, including the Technology Literacy Challenge Fund program.

The State Board of Education acknowledges the instrumental role played by the State Superintendent's Educational Technology Advisory Group (ETAG) in assisting MDE in the preparation of *Michigan's State Technology Plan (1998)*. Approximately 40 groups and organizations participated in the process and provided support and staff assistance. Membership was composed of public and private sector stakeholders in the application of technology in the educational mission, including public and nonpublic schools, public school academies, colleges and universities, libraries, businesses, plus teachers, school administrators and business officials, media and curriculum specialists, parents and students. It is the Board's intent that ETAG continue to provide advice and expertise in implementation and periodic updates of the *Plan*.

The Board also recognizes the role that technology itself played in the creation of *Michigan's State Technology Plan (1998)*. It would not have been possible for ETAG and MDE to maintain their ambitious timetable without reliance on a variety of online and video technologies to assist with topical research, public opinion sampling, information dissemination and, ultimately, development of the final document. It is the first state policy document adopted by the Board, though certainly not the last, to utilize voice, video and data technology to such a great extent.

I. POSITION OF THE STATE BOARD OF EDUCATION

Educators in Michigan have a long-standing tradition of supporting the application of technology in the education process. The State Board of Education remains committed to policies and initiatives which further this effort.

A state technology plan must be multidimensional in nature and serve numerous sectors of the learning community, but it will ultimately be judged according to its impact on students and student achievement. The State Board of Education, in adopting *Michigan's State Technology Plan (1998)*, identifies the following as the collective purpose of this document:

- To offer a vision regarding the use of technology in education and the manner in which it contributes to providing equitable access to learning opportunities for all students;
- To chart a course for the utilization of technology in the learning environment to benefit student achievement and performance and to customize an education to meet every student's needs and abilities;
- To advance existing technology activities and encourage the establishment of complementary state, federal and local initiatives and policies that are supportive of technology in education;
- To advocate that all educational institutions in Michigan become actively engaged in the dialogue about, planning for and use of technology to advance their educational missions and better prepare students for life in the 21st century.

Michigan's State Technology Plan (1998) is the most recent in a series of policy documents focusing on technology in education that has been adopted by the State Board of Education. The Board's first state technology plan was approved in 1987. It was followed in 1990 by *Education: Where the Next Century Begins*, a document that proposed the creation of a five-year state technology plan. That recommendation was realized two years later when *Michigan's State Technology Plan (1992-1997)* received Board approval.

It is the Board's intent that unlike its predecessor, *Michigan's State Technology Plan (1998)* should not have an expiration date. It will be reviewed on a recurring basis and amended as needed to retain the relevance and vitality necessary to serve as "a living document."

II. INTRODUCTION

Education is about the future. The word itself is derived from the Latin "educere," meaning to lead out from. This implies a constant state of change and renewal. Nowhere is this more visible than in the area of technology, where generations come and go practically overnight, and capabilities only dreamed of five years ago are now commonplace. Children enter a world today in which many of the careers they will pursue do not yet exist.

During the past decade, institutions in every segment of society have made sweeping changes related to their design, function and operation. Technology was at the forefront of many of these changes, often accompanied by organizational discomfort. Institutions often experienced an initial decrease in productivity when adopting new technologies. Benefits accrued only after technology was effectively institutionalized.

It has been estimated that the lag time between the generation of educational research and the implementation of new teaching practices is nearly 10-15 years. In contrast, the life cycle of many technologies is often less than five years. This poses a challenge to educators as technology becomes increasingly valuable as an instructional tool. Various surveys show that many schools in Michigan are playing a game of "catch up." The lack of up-to-date hardware and software, as well as training, technical support and local networking infrastructure, is slowing

the widespread implementation of technology in schools. Some schools are unable to make large investments due to ongoing financial constraints. Even schools that have been successful in acquiring state-of-the-art technology may fall short of realizing significant gains in student achievement.

Nevertheless, schools have more access to technology today than ever before. There are a growing number of students, teachers, administrators and parents who are using powerful tools to conduct research, prepare electronic portfolios, collaborate on projects, simulate complex mathematical equations, engage in discussions with experts, publish work online, develop new communication skills and assume greater responsibility for their own learning and professional development. The use of technology is helping to transform education, replacing a traditional reliance on conventional practices with strategies that help tailor the educational environment to address the needs of each student. *Figure 1* contrasts traditional approaches with technology-enhanced teaching and learning environments.

The real promise of technology in education lies in its potential to facilitate fundamental, qualitative changes in the nature of teaching and learning. Using technology to restructure schools should not mean automating conventional practices, but instead purposefully changing significant aspects of the entire process. Technology opens the door for self-paced, individualized instruction and student-centered learning. It creates opportunities to access worldwide information resources and develop knowledge within new contexts. Technology contributes to the improvement of two-way, school-home communications to better engage parents in the learning activities of their children. It offers the potential to empower historically disadvantaged groups such as students with disabilities by providing them with greater access to communications and learning tools.

Technology has been called "a road to the world," and now more than ever it offers the opportunity for learning to occur anywhere, at anytime, for anyone. It is forcing educators to rethink what is meant by terms such as "classroom," "school" and "student." It is giving learners of all ages an opportunity to create a future of their own.

Figure 1: The Transformation of Education

Traditional Approach Consists of:	*Technology Allows More of:*
Teacher-centered learning	*Student-centered learning*
Mass instruction (one size fits all)	*Mass customization with instruction to fit individual student needs*
One pace applies to all students	*Flexible pacing based on student abilities*
Classroom and school building	*Distributed learning possible from anyplace*
Learning during school hours	*Learning at anytime*
Facts and recitation	*Critical thinking in real-world contexts*
Individual student performance	*Collaboration and dialogue among students and between students and teachers*
Textbooks	*Up-to-date primary information resources*
Parent-teacher meeting each semester	*Parent-teacher communication available daily*

III. HISTORY OF STATE TECHNOLOGY PLANNING

Michigan's State Technology Plan (1998) draws a portion of its strength from the comparatively recent past, perhaps unusual given the portrayal of technology as a pathway to the future. Of a number of technology policy documents, including the *Michigan State Board of Education Technology Plan (1987)* and even earlier calls for a statewide computer network linking educational institutions, two documents approved by the State Board of Education warrant special mention:

- *Education: Where the Next Century Begins (1990);*
- *Michigan's State Technology Plan (1992-1997).*

Education: Where the Next Century Begins featured 14 Goals, including one that called for the creation of a five-year state technology plan. It also encouraged coordination in four major areas: 1) investments in educational technology; 2) support for the integration of technology-based programs in the curriculum; 3) technical assistance to educational agencies to maximize the successful use of technology; and 4) professional development to upgrade the technological skills of educators. Two years later, *Michigan's State Technology Plan (1992-1997)* was adopted by the State Board of Education. It included 22 Recommendations categorized into five major themes: 1) restructuring schools using technology; 2) developing statewide telecommunications systems for teaching, learning and communication; 3) professional development for the learning community; 4) technology investments for the future; and 5) copyright and fair use implications.

It is an illustration of the vision of these two documents and the State Board of Education that all categories and themes, including the conclusion in 1992 that public education was the last major labor-intensive industry to incorporate technology into its day-to-day activities, remain relevant today. In particular, *Michigan's State Technology Plan (1992-1997)* provided leadership and guidance to the educational community throughout the state, including the Michigan Department of Education. The *Plan's* role in heightening awareness of the potential for technology to benefit education and student learning has been noteworthy.

IV. ALIGNMENT WITH OTHER INITIATIVES

Technology planning on the federal, state, regional and local levels cannot be conducted in a vacuum, by one or two or only a small handful of people within a single institution, and still be of value in the practical application of technology-based solutions. Technology represents a thread to be woven through many other planning and policy initiatives. It can strengthen because of its presence or weaken due to its absence. Equally important, educational technology policies at all levels perform best when they are mutually advantageous and supportive of each other.

Significant to *Michigan's State Technology Plan (1998)* is the *Instructional Technology Across the Curriculum (ITAC)* initiative. *Michigan's State Technology Plan (1998)* benefits by recognizing and referring to the findings, proposals and knowledge of experts active in projects such as ITAC and the Ad Hoc Referent Committee for Preservice Technology. The latter seeks to supplement existing state standards for entry-level teachers. Further, immediate credibility can be gained if the *Plan* is consistent with requirements of Michigan's Revised School Code of 1995, in particular the provision that schools have annually-updated school improvement plans, which include a technology component.

The ability to implement some of the recommendations in *Michigan's State Technology Plan (1998)* are dependent on the successful execution of other state initiatives. One example is the proposed creation of a virtual Michigan Information Network, an initiative involving a number of state agencies in close collaboration with many non-governmental organizations and providers of telecommunications services. The *Plan* must complement, and MDE must provide some staff resources to help realize, such a communications network and its subsequent value to students and educators throughout Michigan.

Figure 2: The Four Pillars

The National Plan for Technology in Education, created by the President and the U.S. Department of Education, addresses four primary goals. These are known as "the four pillars" on which the federal government's educational technology program is based. Most of the 21 Recommendations in *Michigan's State Technology Plan (1998)* address issues that correspond with at least one of the four pillars. The recommendations are referenced in brackets beneath each pillar description.

- Training — All teachers in the nation will have the training and support they need to help students learn through computers and the Information Superhighway.

  [Michigan Recommendations 2,4,5,6,8,9,12]

- Hardware — All teachers and students will have modern computers in their classrooms.

  [Michigan Recommendations 12,13,14,19]

- Access and Connectivity — Every classroom will be connected to the Information Superhighway.

  [Michigan Recommendations 1,7,10,11,12,13,14,15,20]

- Content Resources — Effective and engaging software and online learning resources will be an integral part of every school curriculum.

  [Michigan Recommendations 1,2,4,6,7,12,14,16,20]

The four pillars were important to Michigan's implementation of the Federal Technology Literacy Challenge Fund program in 1997. The Program provided more than $8 million that was distributed to Michigan schools on a competitive grant basis.

Programs of the federal government demand federal-state synergy. National technology goals of the President are embodied in initiatives such as the Technology Literacy Challenge Fund program. In 1997, more than $8 million was awarded to Michigan schools on a competitive grant basis under this program. Expectations of an increased state allocation exist for the next four years. To participate, though, Michigan must have a state technology plan that is approved by the U.S. Department of Education. Similarly, school districts must have state-approved technology plans if they are to benefit from the federal Universal Service Fund (USF) program and its promise of providing schools with discounts of 20 to 90 percent on a variety of telecommunications services, including Internet access and internal wiring.

V. ASSESSMENT OF MICHIGAN'S PERFORMANCE

To establish realistic goals, to prepare strategies to achieve them and to devise methods by which accomplishments will be measured demand the existence of base line data for purposes of comparison. While Michigan has witnessed a tremendous growth in the number of educational video networks since 1992 — more than a 550 percent increase based on data collected in 1996 for the Michigan Department of Education's *Inventory of Instructional Telecommunications Systems in Michigan* — the state's overall educational technology portrait is far less impressive. According to statistical samples released by three organizations, Michigan's performance relative to national figures is rarely above average, on occasion approximately average, and too frequently below average.

For example, Michigan ranks below the national average for schools having local area networks (LANs), based on information available from *Education Week* (November 1997), Market Data Retrieval (1997) and Quality Education Data (1997), and in schools having wide area networks (WANs), according to *Education Week* and Market Data Retrieval. All three report that Michigan is below the national average for schools having Internet access, as well as schools possessing satellite technology. Student ratios per specific information appliance or technology tool are generally below average, and *Education Week* indicates that just 10 percent of Michigan's teachers have had at least nine hours of technology training in their career, versus 15 percent nationally. Only in the percentage of schools having cable television access does Michigan exceed the national average, according to all three sources. While greater access to computers, telecommunications networks, educational software and other information technology tools does not guarantee increased student achievement, students in Michigan appear to have less access than their counterparts in other states.

Though none of the aforementioned publications and survey organizations prepared state-by-state comparisons of educational technology funding, *Education Week* portrayed Michigan as relying almost entirely on federal support coupled with local district and community resources, while other states have benefited from more active involvement by their legislatures. Since 1995, Ohio has invested more than $500 million to wire classrooms, purchase computers and train teachers. Minnesota lawmakers provided appropriations of $32.5 million and $90 million for technology initiatives in 1995 and 1997. The North Carolina legislature agreed in 1994 to provide $381 million over a five-year period for deposit in an interest-bearing school technology trust fund. These comparisons between states do not take into account per pupil expenditures, where Michigan ranks above the national average, nor do they reflect the recent approval of legislation (Public Acts 142, 143 and 144 of 1997) to settle a long-standing legal dispute between state government and local school districts (Durant vs. State of Michigan) that will result in hundreds of millions of dollars being available for investments in educational technology. However, the illustrations do show that those states exhibiting more centralized systems of planning and funding educational technology, accompanied by strong statewide leadership, generally enjoy the greatest amount of progress and forward movement.

A need for Michigan to identify a strategy for adequately funding statewide educational technology programs, plus those of local schools, was identified by the U.S. Department of Education in its response to MDE's application to administer the state's portion of the federal Technology Literacy Challenge Fund program in 1997. Among other things, the federal agency said that Michigan's proposal should include not only direct funding, but also complementary approaches such as incentives, along with contributions from businesses, universities and individuals. Michigan's strategy for funding educational technology in recent years has not been compiled into a single policy approach, but continues to include a variety of components:

- Local school districts in Michigan continue to make substantial commitments of their own. In 1996 and 1997, voters in more than 120 districts approved "qualified" bond issues under the state's School Bond Loan Fund, representing building-level, technology infrastructure investments that exceed $190 million.
- The federal Technology Literacy Challenge Fund featured the distribution of more than $8 million to schools in Michigan under a competitive grant program in 1997. A significant increase in the state's annual allocation is anticipated through the year 2000.
- Informal estimates range up to $100 million annually regarding the potential impact in Michigan of the federal Universal Service Fund (USF) program. USF discounts will be available to schools and libraries for a variety of telecommunications services, plus internal wiring and Internet access.
- The settlement in 1997 of the Durant case between 84 local and intermediate public school districts and the State of Michigan includes a payment of $212 million to those districts, plus a total investment of more than $600 million over ten years to non-plaintiff districts. Allowable uses of that latter figure include electronic instructional material and software, technology, infrastructure and infrastructure improvements, and training for technology.

- More than $10 million of excess earnings of Ameritech were distributed to two statewide and six regional educational technology programs beginning in 1995, under a program administered by the Michigan Public Service Commission. Ameritech matched that figure with a contribution of its own.
- The Michigan Telecommunications Act introduced a significant degree of competition into the state's telecommunications market in 1992, that firmly expresses the belief that competition will reduce prices for all customers, including schools.

Policymakers and educators in Michigan must assemble and organize the preceding initiatives, along with other efforts, into a comprehensive strategy that will better assist schools in financially supporting educational technology programs. A first step is to continue gathering information that will allow the state to better evaluate its current status. In 1997, Michigan actively participated in the collection of data for a national educational technology survey. MDE worked in cooperation with Quality Education Data of Denver. The resulting state profile, *ProjectEdTech*, was released in May 1997. In 1996, MDE updated its *Inventory of Instructional Telecommunications Systems in Michigan* to help chart the growth of educational networks in the state. MDE will continue its involvement with these types of data-gathering initiatives, and whenever possible introduce survey questions that will help establish base line data to assist in measuring the success of recommendations included in *Michigan's State Technology Plan (1998)*.

Figure 3: Definitions for Technology and Related Terms

References to technology, technology literacy and similar words and phrases can be confusing. There are formal definitions, as well as informal descriptions and usage. There is no shortage of either.

There are two general applications or uses of technology that are particularly relevant to *Michigans's State Technology Plan (1998)*:

- *Developing the skills necessary to operate various technologies*, such as a computer word processing software program, an Internet web browser, a video camera, a graphing calculator, a personal digital assistant or an alternate input device.
- *Applying the aforementioned skills in a search for knowledge and information or for the completion of specific educational, workplace or personal tasks*, such as multiple-site, collaborative student learning, geographic information systems (GIS) data mapping, or computer-assisted drafting/computer-assisted machining (CAD/CAM).

"Technology" has been informally described as any tool invented after a person is born. This concept reinforces the generational aspects of technological innovations such as an automobile, a television, a microwave oven or a laptop computer. Many children today consider a computer to be a little more than another electronic appliance. The term "technology" as used in this *Plan* encompasses assistive technology, technology education, instructional technology and industrial technology.

Michigan's State Technology Plan (1998) is strengthened to the degree that it can use existing definitions and descriptions, especially those included in current state and federal policy documents. One document in particular, *Instructional Technology Across the Curriculum (ITAC)*, was created by the Michigan Department of Education (MDE) and a coalition of educational organizations, and relies heavily on another MDE publication, *Technology Content Standards and Benchmarks* (1996). Key portions of the following definitions are drawn from these sources:

- "Technology" is the systematic application of knowledge, materials, tools and skills to extend human capabilities. A "technology curriculum" integrates the complementary areas of technology education and instructional technology.
- "Technology education" is defined as the study of technology and its effects on individuals, society and civilization. It is a subject or content area, but can include the development of specific technology benchmarks or proficiencies. It helps place student learning into practical and useful real-world contexts.

- "Instructional technology," sometimes identified as "educational technology," is the application of technology to the teaching and learning process. Sample activities include enabling students to complete assignments, access information, and integrate knowledge and skills. The phrase also encompasses the application of technology to administrative functions of an educational institution. It has sometimes been used solely in reference to computers and the Internet, but that is an inappropriately narrow application.
- A "technologically literate learner" is one who explores, evaluates and uses technology to accomplish, independently and cooperatively, real world tasks; develops knowledge, ability and responsibility in the uses of resources, processes and systems of technology; acquires, organizes, analyzes and presents information; expands the range and effectiveness of communication skills; solves problems, accomplishes tasks and expresses individual creativity; and applies legal and ethical standards.

"Industrial technology" is a commonly used phrase that refers to a practical application of technology in the use of materials, tools and processes in industrial settings. According to MDE's teacher preparation standards, the teaching of industrial technology can include many of the same concepts — critical thinking, problem solving, human dynamics, creativity and invention — that are stressed when technology-assisted learning occurs in standard classrooms.

References to "infrastructure" in *Michigan's State Technology Plan (1998)* are defined according to common understanding. "Technology infrastructure" refers to, among other things, cabling and wiring, computers and software programs, satellite transmission and reception facilities, and switching equipment necessary for the operation of telecommunications networks and instructional programs. "Human infrastructure" generally means teachers, media specialists, administrators, students and others needed to implement and sustain an educational technology program.

A definition of a "technology program" is, to a great extent, situational, to be determined by individual educational institutions. Technology programs frequently incorporate technology planning, administration, training, support and funding, plus the actual application of technology in the learning environment.

Figure 4: Educational Outcomes Derived From Technology

Research on educational outcomes reporting that technology benefits student learning appears to be on the rise. Empirical data reinforces beliefs help by many teachers and other educators that technology, when properly employed, enhances, and has the potential to expand educational horizons and student performance.

At least three publications have attempted to summarize existing research on the impact of technology on education:

- *Computers and Classrooms: The Status of Technology in U.S. Schools* (1997), Educational Testing Service.
- *Report on the Effectiveness of Technology in Schools* (1995-1996), Software Publishers Association.
- *The ACOT Research Portfolio* (1994), Student Engagement (Report #21), Apple Classrooms of Tomorrow.

Studies highlighted in each report show that student attitudes toward learning can be bolstered when technology is used in the learning environment. Technology can help improve student performance and increase student motivation and teacher satisfaction. However, carefully designed assessments that present conclusive findings are far outnumbered by claims that technology benefits education.

Most of the immediately identifiable research is national in scope. It does not focus on the impact of technology on students and teachers in Michigan. Educators at local, regional and state levels should be watchful for opportunities to incorporate outcome measurements in the technology programs that they launch, maintain and administer. Such research would nicely complement anecdotal evidence that is comparatively commonplace.

BELIEF STATEMENTS

In adopting the following belief statements related to the use of technology in education, the State Board of Education recognizes the work of the State Superintendent's Educational Technology Advisory Group (ETAG) and the many challenges that it faced. As members of ETAG proposed and discussed possible recommendations related to the application of technology in the learning environment, it became apparent that a significant number of those proposals serve a more fundamental purpose than does an actual recommendation. These concepts came to be called "Belief Statements," upon which many of the recommendations are based.

- *Each school district should establish policies that encourage and support the carefully planned use of technology to increase learning opportunities for students, faculty, administrators, support personnel and community members, and to integrate technology into the curriculum to enrich and expand the learning environment.*
- *Instructional and administrative applications of technology must drive decisions related to the acquisition of new technology and subsequent activities that provide staff training and professional development in the use of technology.*
- *Technology plans are not stand-alone documents; technology planning, both for curriculum integration and physical plant upgrades, must be undertaken in coordination with school improvement plans and school reform initiatives.*
- *Electronic access must be provided to educational resources during times of the day, week and year when school is not in session, since student learning is not an exercise restricted to the traditional school day and the standard classroom.*
- *Schools must strive to remove all identifiable gender, racial, cultural, disability or similarly-based barriers in providing student, teacher and staff access to, and support for participation in, technology-based learning environments.*
- *All school districts should establish a process and written guidelines to provide consistency in the delivery of assistive technology services and devices to individuals with disabilities, in accordance with the Individuals with Disabilities Education Act of 1997 (IDEA).*
- *Students should have opportunities to use a wide variety of technologies, including multimedia computers and graphing calculators, plus peripherals such as videocassette players, scanners and digital cameras, in grade- or age-appropriate ways to research and complete learning assignments, and to create, present, display and publish their learning and academic performance.*
- *School districts have an obligation to develop and disseminate policies to help ensure that students, parents, teachers and staff are aware of the potential hazards related to the use of information technology tools; possible hazards encompass not only health and safety issues such as eyestrain and carpel tunnel syndrome, but also those related to student access to inappropriate content resources.*
- *There is a general, but not rigid progression of successively more sophisticated innovations that help characterize schools and school districts as technologically capable, to benefit students by improving both the learning environment and school-home communications. Each of the following innovations has implications for the training of teachers, staff, students and parents.*
  - *a) Each school and every teacher in the school having voice mail;*
  - *b) Each school, and consequently each local community and telephone exchange, having local dial-up access to the Internet;*
  - *c) Each school having a dedicated (direct) connection to the Internet;*
  - *d) Each teacher, staff member and administrator in a school having an e-mail account, with access from home and school;*

e) *Each classroom, administrative office, counseling center and library media center having a connection to local and/or wide area networks (LANs/WANs) to provide access to shared educational resources and increased operational efficiencies;*

f) *Each school district having a web page for publication of its curriculum and other information on the World Wide Web, providing convenient access by parents, students, community members and other individuals;*

g) *Each school having a web page for the dissemination of building-specific information;*

h) *Each school having access to multi-band satellite reception;*

i) *Each school district having access to interactive video.*

- *An integrated telecommunications network that is widely and easily accessible by educational institutions throughout the state requires the adoption of technical standards.*
- *Educators should seek to establish community partnerships and collaborative endeavors to successfully implement technology solutions, especially when challenges are shared by neighboring educational institutions, libraries, nonprofit organizations, private businesses and government agencies.*
- *Intermediate school districts and/or regional educational media centers are appropriate agencies to assist the Michigan Department of Education in servicing and supporting local districts in planning and implementing technology programs.*
- *The Michigan Department of Education must strengthen its efforts in the innovative use of state-of-the-art technologies to more efficiently deliver services to Michigan's educational community.*
- *States possessing creative leadership, especially strong and tireless champions for the instructional and administrative applications of technology in schools, have the best chance to achieve significant progress in the funding and use of new technologies to the betterment of student learning.*

RECOMMENDATIONS

The State Board of Education adopts the following 21 Recommendations with the understanding that they are essential and significant steps necessary to advance the application of technology in the learning environment and provide substantial benefit to students throughout Michigan. The progression of Recommendations is thematic, and not necessarily subject to prioritization.

RECOMMENDATION 1: Equity

Challenge: Technology is having a profound effect on education, but the benefits of technological innovation on the educational mission and administrative functions of schools throughout Michigan vary widely, depending not only on the local availability and commitment of financial and human resources, but also on the receptivity to change within each community. As accessibility to educational resources skyrockets through the use of technology, it is critical that all students in Michigan have an equal opportunity to participate in technology-assisted learning. Otherwise, Michigan risks failure to serve learners at greatest risk: those with special needs including disabilities; those who may be very young or, alternately, older adults; those for whom English is not their native language; those scoring poorly on standardized tests; those from low socio-economic backgrounds; those for whom a historic technology bias exists; and those living in remote areas that lack access to a full spectrum of curriculum choices and informational resources.

Recommendation: The State Board of Education (SBE), working in conjunction with the Governor's Office, the Michigan Legislature and broad educational interests in the state, should examine issues regarding access to technology-delivered learning opportunities and resources for all students, then develop and support policies which promote and improve equity.

Rationale and Implementation: The development and support of state educational policy is a function of the State Board of Education and the Michigan Department of Education (MDE). The recommendation is dependent on having support from policymakers at the highest levels of state government, including the Governor's Office and the Michigan Legislature. It is also imperative that subsequent support be offered at the regional and local levels within the educational community. Research conducted in the process of creating policies related to equity of opportunity to technology-assisted learning will help identify an overall dollar figure necessary to implement technology solutions for Michigan schools. It is important that the settlement in the Durant case be evaluated regarding the impact that it may have on providing greater equity in technology-based learning opportunities for students.

Resources: The development of policies providing equitable access to technology to benefit student learning would require minimal financial resources. However, the actual implementation of such policies by schools in Michigan will involve a significant investment in technology.

Success: State policies should be adopted by December 31, 1999 that identify the importance of the basic application of technology by schools to the provision of equitable learning opportunities for all students. These policies should include an estimate of financial need, plus strategies for addressing funding needs.

RECOMMENDATION 2: Technology Integration

Challenge: The practice and assessment of technology-assisted teaching is often limited by a lack of student competency with technology-based tools. Without meaningful and objective criteria for measuring student skills, technology expectations can be unrealistic. Without grade-specific objectives for student competencies and practical methods of measuring those competencies, educators have no means of evaluating the effectiveness of instructional technology. Even when educators have established student technology competencies, they may not include authentic performance expectations.

Recommendation: The core curriculum of each school should address the use of technology as an integral part of student learning in each content area, including specific technology knowledge and skills needed by students. Technology should be addressed in a school assessment plan to evaluate learning about technology and the use of technology to enhance learning.

Rationale and Implementation: Over the past several years, Michigan educators have developed content standards and benchmarks in each subject area. The document, *Working Draft Content Standards and Benchmarks* (1996), is available to give guidance to Michigan schools regarding what all students need to know and be able to accomplish in technology and in each content area. To assist this effort, the document, *Instructional Technologies Across the Curriculum* (ITAC), is being finalized by the Michigan Department of Education (MDE) and the special task force of educational groups that created it. It includes a toolkit designed to accompany the *Michigan Curriculum Framework*, and addresses the use of technology in each content area, at each level of schooling. It will be available for use by the state's K-12 educational community to specify the skills needed for students to use technology, and to help guide the application of technology skills in instructional activities in the core academic content areas. The latter includes access to real world/primary data for use on a content-appropriate basis. As schools address technology in their locally developed curriculum, they should utilize the expertise of teachers, curriculum and technology professionals, and others in the community. MDE and leading educational groups in Michigan must work together to disseminate state recommendations. State and local guidelines should be reviewed regularly and amended to ensure conformance with current technologies and evolving educational practices. All educators must be watchful for research on learning outcomes and evaluations of student performance that can be attributed to technology.

Resources: Staff resources of MDE will finalize and, assisted by state educational organizations, disseminate the ITAC toolkit by October 1, 1998. Primary distribution will be via MDE's web pages (MDEnet), with supplementary efforts to ensure that the document reaches school administrators throughout the state. At the regional and local levels, substantial time commitments are needed from school and district staffs, along with parents, library media specialists and business leaders for the preparation, adoption and implementation of technology guidelines in local curricula.

Success: The initial step in determining the success of this recommendation is the finalization of the ITAC toolkit by MDE, and the subsequent distribution of these guidelines to educators. Long-term success will be measured by the number of schools and school districts using the ITAC toolkit in the development and use of technology across their own curriculum.

Citation: *Instructional Technology Across the Curriculum (ITAC)*
Draft K-12 Instructional Technology Standards
http://cdp.mde.state.mi.us/itac/Page1.html

RECOMMENDATION 3: Competency Expectations of K-12 Graduates

Challenge: Practical uses for, experience with, and even awareness of technology in everyday life and in the workplace are not universally available to teachers and learners. In addition, teachers and learners may not be up-to-date about the expectations of higher education regarding student abilities to perform technology-based learning.

Recommendation: Schools should partner with businesses, community colleges, universities and community organizations to assist in keeping the local school community, including teachers and students, aware of expectations demanding that graduates of the K-12 system have specific technological skills to successfully compete in the job market or to perform in postsecondary educational environments.

Rationale and Implementation: Businesses, community colleges, universities and community organizations can all work to establish partnerships with schools, but schools should not wait for others to take the initiative. It is in the best interests of students that schools be proactive. Communication links between schools and higher education institutions could be more consistent from district to district. The continued support of initiatives through the Career Preparation System (including Career and Technical Education, Tech Prep and School-To-Work programs) would be beneficial. Other partnerships with businesses can produce invitations to educators, students and parents to visit the workplace to view technologies and their practical applications. These collaborations may provide students with technology-based work experiences and opportunities to develop technology-related skills. Also, internships can be investigated that place teachers with local technology-based businesses during summer months. In communities where opportunities to link with such businesses are limited or nonexistent, electronic partnerships with more distant companies can be explored.

Resources: Staffing and funding implications are strongest at the local level. Ongoing support and development of existing and additional programs that create opportunities for students to learn in the workplace, as well as opportunities for businesses to contribute to the learning experience, may need to be supplemented. Some schools may lack computer equipment and software needed to access regional and state work-based education and employment opportunity data bases. Schools must also provide staff opportunities to interact with higher education institutions.

Success: An initial measurement of accomplishment features an increase in the number of school partnerships involving businesses, community colleges, universities and community organizations. A second step includes expectations that the number of students benefiting from these partnerships, especially the exchange of information about post-K-12 expectations regarding technology capabilities, will increase. The number of Michigan schools establishing local partnerships is a possible topic to be included in an annual survey of Michigan schools, such as the one conducted by Quality Education Data (QED) and the Michigan Department of Education (MDE) in 1997. Some data may also be collected by the Michigan Jobs Commission.

Citations: Michigan Center for Career and Technical Education (MCCTE)
School-To-Work Program
http://mccte.educ.msu.edu/stw/index.html

Michigan's School-To-Work (STW) Network
Michigan Employment Security Agency
http://irn.tcimet.net/STW/Pdocs/STW-Welcome.cfm

RECOMMENDATION 4: Training

Challenge: The shortfall in training and professional development opportunities is routinely identified as Michigan's most pressing need related to technology-assisted teaching and learning. All educators, but especially teachers, must upgrade their skills if technology is to be effectively integrated into teaching and the curriculum, and also support the administrative responsibilities of schools. More training opportunities are needed to increase the capabilities and comfort levels of educators with new technologies that possess instructional and administrative value. Without such training and subsequent technology use, schools have difficulty demonstrating a fair return on dollars invested in technology hardware, software and infrastructure.

Recommendation: Ongoing training opportunities that build the general level of technology expertise of educators throughout Michigan must be significantly expanded.

Rationale and Implementation: An online survey conducted by the State Superintendent's Educational Technology Advisory Group (ETAG) in October 1997 produced overwhelming support — over 95% of more than 400 respondents — for increasing training opportunities to build the general level of technology expertise among educators in Michigan. This is not surprising since *Education Week* (November 1997) reported that just 10 percent of Michigan's teachers had at least nine hours of technology training. Participation in the ETAG survey by teachers, administrators, media specialists and technology coordinators was roughly the same even though, for example, the needs of a teacher attempting to integrate technology into a classroom differ from those of a building principal having responsibility for the overall administration of a school technology program. The Michigan Department of Education (MDE) should act as a facilitator in increasing the number of training opportunities, working in conjunction with educational organizations, colleges and universities, local and intermediate school districts (ISDs), and regional educational media centers (REMCs). A prompt review of the training needs of teachers and other educators is needed, followed by an assessment of which training needs are being met, in whole or in part. The critical next step is supplementing existing training programs to meet the shortfall in training opportunities. Delivery mechanisms must be explored that help overcome the shortage of substitute teachers, which prevents many teachers from being released from regular classroom duties. Technology itself can be an alternative strategy in helping to deliver training of all types, including the acquisition of continuing education units (CEUs) by teachers. Training programs themselves may be established or expanded by ISDs, REMCs, colleges and universities, educational organizations, libraries, nonprofit groups or private companies. A model of multi-institutional collaboration involving many of these types of entities has been SupportNet, a one-year initiative of the Merit Network, funded through the Michigan Public Service Commission, to deliver Internet training and help desk services to a core of the state's educational community.

Resources: Staff resources of MDE, especially through 1998, are necessary to launch the implementation of this recommendation. Considerable input and support is essential from educational organizations and institutions, with a long-term commitment that emphasizes leadership and financial support necessary from local school districts. Establishing or supplementing existing training programs themselves would incur a dollar expense that is believed to be significant, but which has not been estimated. To help leverage local and regional resources, MDE will earmark a significant amount of the state's apportionment of the federal Technology Literacy Challenge Fund program in 1998 to provide financial support for technology training initiatives. Collaborative training initiatives involving schools, school districts, libraries, health care facilities, nonprofit groups and private businesses can help minimize training costs not only in rural and remote regions of Michigan, but also in the state's urban and central city areas.

Success: A review of technology training needs and existing training programs will be completed by a coalition of educational organizations and institutions, led by MDE, no later than June 1, 1998 (or an alternate date pending a schedule for receiving applications and making funding decisions for the state's administration of the Technology Literacy Challenge Fund program). By September 1, 1998, the State Board of Education will approve

Technology Literacy Challenge Fund grants intended to aid in establishing and/or supplementing existing training programs. Ultimate success will be achieved when a significant majority of teachers and other educators in Michigan have the skills necessary to better incorporate technology into the educational and administrative missions of schools. An annual survey of K-12 schools, such as that conducted by MDE and Quality Education Data (QED) in 1997, could be instrumental in the collection of this information.

Citation: SupportNet, Merit Network, Inc.
http://www.merit.edu/k12.michigan/supportnet/

RECOMMENDATION 5: Technology Budgets and Training

Challenge: A significant percentage of public and nonpublic school teachers in Michigan are characterized as having only beginning technology skills or, worse, no skills at all, according to *ProjectEdTech*, a 1997 survey of K-12 school buildings in the state that was jointly conducted by Quality Education Data (QED) and the Michigan Department of Education (MDE). Yet support for technology training for teachers and other school staff to integrate technology into the educational and administrative missions is inconsistent from one school to the next. In some districts, financial resources are especially scarce. In a few others, false hopes are raised that technology is a one-time expense involving little beyond hardware and software acquisition.

Recommendation: Each school district should dedicate, on a recurring basis, a specific and significant portion of its technology budget for ongoing staff training to assist with the effective and efficient use of instructional technology.

Rationale and Implementation: As educators integrate technology and related telecommunication services into their curriculum and their budgets, the perceived need to allocate funds to support technical upgrades, maintenance and support, and to cover continuing expenses, is frequently more apparent than the need for money to boost the technical capabilities of teachers and staff. Establishing a budget item dedicated to technology training is a constant reminder to schools and school districts to invest in human resources. This strategy should be reflected in a district's technology plan. Intermediate school districts (ISDs) and regional educational media centers (REMCs) should continue to assist local districts in planning and implementing this recommendation.

Resources: Local school districts must be creative in using funds from a variety of sources to assist in technology training, including operating dollars and selected grant funds and savings achieved from participation in the federal Universal Service Fund discount program for telecommunications services to schools and libraries. This basic strategy must be accompanied by an annual dollar commitment from school districts for ongoing technology training. A 1995 report (Teachers and Technology: Making the Connection) of the U.S. Office of Technology Assessment suggested that at least 30 percent of a school district's technology spending should be dedicated to staff training. States such as Texas have adopted that model, but a survey by QED in 1996-97 reported that, on average, districts earmark only five percent of their technology budgets for training. By comparison, estimates for private sector investments in technology, computer and/or technical skills training range from 30-40 percent of total training funds (American Society for Training and Development), to 30 percent of total operating budgets (*Training Magazine*). Others informally claim that private sector institutions routinely invest 50 percent of a total technology budget in technology training and support.

Success: The successful implementation of this recommendation depends upon schools establishing a regular budget item that addresses the need to support technology training for teachers and staff. Further, these allocated funds must be substantive enough to address the identified training needs.

Citations:

ProjectEdTech (1996-97): Michigan: State Tech Survey Report
Quality Education Data and Michigan Department of Education
http://www.mde.state.mi.us/tplan/qed.shtml

Teachers and Technology: Making the Connection (1995)
U.S. Office of Technology Assessment
http://www.ota.nap.edu/pdf/data/1995/9541.PDF

Universal Service Fund Information Page
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/

Long-Range Plan for Technology (1996-2010), Texas Education Agency
http://www.tea.state.tx.us/technology/lrpt/eduprep.pdf

ASTD's Benchmarking Forum: Training Expenditures by Course Type (1996).
American Society for Training and Development
http://www.astd.org/who/research/benchmar/b-stats.htm

RECOMMENDATION 6: Teacher Competencies

Challenge: The use of technology in classrooms is growing in Michigan, making it imperative that teachers keep pace with new developments and be able to apply technology in an appropriate and effective manner in the learning environment. But according to *ProjectEdTech*, a 1997 survey of K-12 school buildings in Michigan, jointly conducted by Quality Education Data (QED) and the Michigan Department of Education (MDE), public schools and nonpublic schools rated only 15 percent and 11 percent of their teachers, respectively, as having advanced technology skills.

Recommendation: The State Board of Education and leading educational organizations in Michigan must reiterate the importance of new teachers having the ability to use information technologies to enhance teaching and learning. School districts must be encouraged to include technological competency as an aspect of teacher hiring and evaluation.

Rationale and Implementation: Teachers must be increasingly proficient not only in the operation of computers, video equipment and similar technologies, but also in their ability to instruct students in the use and application of these technologies. The State Board of Education and MDE have an immediate role in implementing this recommendation through the approval of a seventh skill standard — one that emphasizes the importance of new teachers having an ability to use information technology to enhance learning — to the *Entry Level Standards for Michigan Teachers*.

This will lead to technology skills being incorporated into the other six skill areas to achieve maximum effectiveness. Colleges and universities that train teachers should evaluate their respective programs, including the degree to which they include technology-related recommendations of the National Council for Accreditation of Teacher Education (NCATE). Local school districts should increase the use of technology skills as an important component in the hiring and evaluation of teachers. Some local districts may need to develop policies that address technology-based performance expectations for teachers.

Resources: Financial resources necessary to implement this recommendation are relatively minor, unless a college or university must make major investments to effectively train new teachers to comply with seventh skill standard requirements or schools must launch new training programs to provide the opportunity for teachers to gain proficiency in the use of technology. The ongoing approval and review processes administered through MDE's Office of Professional Preparation Services already monitor compliance with state guidelines and should incur no significant cost increase due to a new standard.

Success: A key measurement of accomplishment is the implementation of the seventh skill standard focusing on technology to the *Entry Level Standards for Michigan Teachers*, then its adoption by colleges and universities that train new teachers. Long-term, but less easily measured success would be illustrated by having all local school districts in Michigan employ technology competency as an important aspect of teacher hiring and evaluation. MDE could incorporate a question addressing formal technology training for teachers in an annual survey of K-12 schools, such as the one conducted with Quality Education Data (QED) in 1997.

Citations: *ProjectEdTech (1996-97): Michigan: State Tech Survey Report*
Quality Education Data and Michigan Department of Education
http://www.mde.state.mi.us/tplan/qed.shtml

Proposed Seventh Standard, Entry-Level Standards for Michigan Teachers
Ad Hoc Referent Committee for Preservice Technology,
Michigan Department of Education
http://www.mde.state.mi.us/tplan/presrvtech/index.shtml

Technology and the New Professional Teacher:
Preparing for the 21st Century Classroom
National Council for Accreditation of Teacher Education (NCATE)
http://www.ncate.org/specfoc/techrpt.html

RECOMMENDATION 7: Information Clearinghouse

Challenge: The application of technology in education lacks the definition and standards of an established discipline, yet there is a vast range of technology-related issues about which educators are expected to be knowledgeable. Topics range from integrating technology across the curriculum, to adopting acceptable use and copyright policies; from protecting the confidentiality of school records, to addressing student access to inappropriate electronic content; and from obtaining reliable information about funding programs, to addressing the "Year 2000" problem. It is an arduous and time-consuming task for teachers, media specialists and school administrators to locate documents that identify research and methodologies focusing on "best practices" in the integration of technology into the curriculum and school management functions.

Recommendation: The Michigan Department of Education (MDE) should work with local and intermediate school districts (ISDs), regional educational media centers (REMCs), colleges and universities, libraries and educational organizations to create an electronic, statewide clearinghouse intended for the discovery and exchange of "best practices" in technology-centered learning, teaching and educational administration.

Rationale and Implementation: A clearinghouse would enable educators to learn from the applied research and practice of other education professionals. The coordination of this recommendation rests with MDE, though the identification and evaluation of many "best practices" models must be accomplished in conjunction with local school districts, ISDs, REMCs, colleges and universities, and other educational organizations, especially those that are developing, implementing and piloting programs that demonstrate effective applications of technology-centered learning and teaching. MDE is pioneering a clearinghouse of this type (the Michigan Statewide Systemic Initiative's Dialogue Web project) and has created other, smaller scale resources (a technology planning page to assist with the update of the State Technology Plan). Many institutions in Michigan perform similar functions, including the Wayne County Regional Educational Service Agency (its Explorer Resource Library offering instructional software, lab activities, lesson plans and student-created materials for K-12 mathematics and science education), the Michigan Electronic Library and the Merit Network (in particular, its webpages devoted to the federal Universal Service Fund program). All information providers must feel ownership of the clearinghouse, as all would be expected to contribute to its resource base.

Resources: Resource obligations would be nominal for each participating organization sharing technology-related information of use to schools, but requirements on the part of a clearinghouse-managing institution might involve more significant staffing and information dissemination capabilities and commitments. MDE may earmark a small portion of federal dollars allocated under the 1998 Technology Literacy Challenge Fund program to help launch a state educational technology clearinghouse. Much dissemination of "best practices" models can be accomplished electronically.

Success: The creation of an organizational framework in which a statewide information technology clearinghouse would operate is a first step toward success, to be accompanied by an evaluation process for "best practices" models. This phase should be completed by October 1, 1998. The launching of the service itself, including the sharing of information resources by educational institutions in Michigan, should occur by June 1, 1999.

Citations: Dialogue Web
Michigan Statewide Systemic Initiative
http://mssi.mde.state.mi.us

Michigan's State Technology Planning Page
Michigan Department of Education
http://www.mde.state.mi.us/tplan/

Explorer Resource Library
Wayne County Regional Educational Service Agency
http://www.greatlakes.k12.mi.us/

Michigan Electronic Library
http://mel.lib.mi.us/

Universal Service Fund Information Page
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/

RECOMMENDATION 8: Technology Staffing Levels

Challenge: Preparedness for technology support, especially core capacity assistance, is often overlooked by schools when implementing a technology program. Practicing teachers rarely have time or even the skills to perform functions such as the installation, maintenance and repair of classroom computers, modems, video cameras and monitors, VCRs and other electronic tools. Yet, according to *ProjectEdTech*, a survey of K-12 school buildings in the state that was conducted in 1997 by Quality Education Data (QED) and the Michigan Department of Education (MDE), more than a third of the public schools and nearly a half of the nonpublic schools indicated that they rely on teachers to handle technical maintenance and support functions.

Recommendation: The Michigan Department of Education (MDE) should work in collaboration with local and intermediate school districts (ISDs), regional educational media centers (REMCs), professional educational organizations and accrediting agencies to recommend voluntary professional and technical staffing guidelines needed to maintain effective educational technology programs in schools and school districts, and in regional K-12 service agencies such as ISDs and REMCs.

Rationale and Implementation: The coordination of this recommendation is the responsibility of MDE, with input from the State Superintendent's Educational Technology Advisory Group (ETAG), which includes representation from many of the affected groups and organizations. Educators must address technical support in school technology plans and in the technology components of school improvement programs. Guidelines that assist educators in determining appropriate support levels are helpful to those that do not have extensive experience operating technology programs. California and Alabama are two states that now highlight the critical need for schools to have specialized staff to handle the technical support, maintenance and repair that is essential to the effective implementation and operation of a quality technology program.

Resources: Staff from MDE combined with input from interested educational institutions and organizations are the primary resources needed to ensure that voluntary technology staffing guidelines are identified for schools and school districts. The eventual dissemination of guidelines can be achieved electronically at minimal cost.

Success: Technology staffing guidelines for schools should be identified by December 31, 1998, then disseminated by MDE and affected educational organizations and institutions soon after. The ultimate indicator of success for this recommendation is reflected in the number of schools and school districts in Michigan that meet the voluntary technology staffing guidelines.

Citations:

ProjectEdTech (1996-97): Michigan: State Tech Survey Report
Quality Education Data and Michigan Department of Education
http://www.mde.state.mi.us/tplan/qed.shtml

K-12 Network Technology Planning Guide (1995)
Network Support (Chapter 8)
California Department of Education
http://www.cde.ca.gov/ftpbranch/retdiv/k12/ntpg/ch08.html

Alabama Technology Plan for K-12 Education (1996)
Implementation Phases and Steps (Section 4.2)
Governor's Council on Education Technology
http://www.alsde.edu/techinit/techplan.htm

RECOMMENDATION 9: Supplementary Technical Support

Challenge: Many schools and at least some school districts cannot afford to have full- or part-time persons on staff to assist teachers in integrating technology across the curriculum or to provide them with the needed technical support for installation, maintenance and repair of video and computer-related equipment, or other electronic teaching tools. Even when staff resources are present, they may be overwhelmed by immediate tasks and hard pressed to keep up with the introduction of new technology and to assist in its appropriate use.

Recommendation: School districts should identify and utilize individuals in their local and school communities who have expertise in the use of appropriate technologies and the ability to work with teachers, staff, administrators, parents and students to increase the efficiency and effectiveness with which technology is applied in the learning environment.

Rationale and Implementation: Local school districts, with assistance from their intermediate school district (ISD) and/or regional educational media center (REMC), are positioned to establish programs providing supplementary support for the integration of technology across the curriculum, as well as in school administrative functions. A wide variety of human resources may be available, including other staff and teachers, students, parents and community members. In particular, students should not be overlooked. By high school, 71 percent of them are using computers as an adjunct to learning, according to *Computers and Classrooms*, a 1997 Educational Testing Service publication. During the 1997-98 school year, Kentucky hopes to initiate a student technology leadership program in every school. Also possible in many schools is informal technology assistance from clerical and administrative staff, or more formal mentorship programs with teachers helping other teachers. Parental help and volunteers from the business community — for example, Tech Corps Michigan — provide additional options. Access to human resources sometimes can be achieved from online technical support available via the Internet. The Michigan Department of Education (MDE) can contribute by working with educational organizations to identify model programs to serve as examples.

Resources: The establishment of a program through which a school or school district can supplement staff resources dedicated to the application of technology to the educational mission may demand at least a temporary reprioritization of staff time to help build long-term support capacity.

Success: An initial, informal measurement of success for this recommendation would be the interest expressed by schools and school districts in identifying models on which they could base the creation of a technology support program of their own. A question related to the manner in, and degree to which, schools utilize talent in their communities could be incorporated into an annual survey of Michigan schools, as was conducted by Quality Education Data (QED) and MDE in 1997.

Citations:

Master Plan for Education Technology (1996 Update)
Kentucky Board of Education
Student Technology Leadership Program
http://www.kde.state.ky.us/edtech/curr_mp1.html#student

Computers and Classrooms: The Status of Technology in U.S. Schools (1997)
Educational Testing Service
http://www.ets.org/research/pic/compclass.html
Chapter 2: Student Use of Computers
ftp://etsis1.ets.org/pub/res/cc-chap2.pdf

Tech Corps Michigan
http://www.merit.edu/~mi-corps/

RECOMMENDATION 10: Infrastructure Support

Challenge: The ability for schools to utilize technology in collaboration with educational programs beyond their own walls and geographical boundaries and to access global information resources requires that the nation's Information Superhighway reaches their doorstep. This is an important concept in Michigan's effort to ensure equitable educational opportunity for all students, not just those living in communities possessing quality telecommunications services at affordable rates. However, the ability of every school in the state to establish a high-quality voice, video and data connection to every other school in Michigan does not yet exist. A ubiquitous telecommunications network serving all educational institutions at affordable rates remains a dream, with no timetable for its establishment and implementation. Individual schools and school districts have limited ability to influence such a large-scale, statewide development.

Recommendation: The Michigan Department of Education (MDE) will work cooperatively with state agencies, educational organizations and others to assist in the establishment of a broad-based user group which will address issues related to and formulate strategies to deal with: 1) coordination among local and regional initiatives to build statewide networking capability; 2) equitable access to and affordable costs for high-quality telecommunications services throughout Michigan; 3) technical standards and network operating protocols; 4) support and technical assistance to ensure quality statewide network operations; and 5) financial resources and purchasing programs to benefit educational technology initiatives.

Rationale and Implementation: The vision of Michigan having a voice, video and data network accessible by all of the state's educational institutions was promoted in *Michigan's State Technology Plan (1992-1997)*, then reinforced in a plan by the Michigan Department of Management and Budget (DMB) in 1995 to create the Michigan Information Network (MIN). The primary impetus for the creation of a broad-based user group to implement the vision of the MIN must come from the Governor's Office and the Michigan Legislature. The Michigan Department of Education (MDE) must be supportive, with participation also needed from DMB and its Office of the MIN, the Michigan Jobs Commission, the Michigan Public Service Commission and the Library of Michigan. Educational organizations representing user groups from around the state must be active. Participation by those with experience creating virtual networks, such as MiCTA (formerly the Michigan Collegiate Telecommunications Association), the Merit Network and many large corporate technology users, would be beneficial. There is also a role for providers of telecommunication services. An initial step is to revisit the MIN Plan to identify what has and has not been accomplished, what may no longer be necessary, plus what has transpired since 1995 that may affect the Plan. Another step is to evaluate the impact of the federal Universal Service Fund (USF) program on providing schools with more affordable telecommunications services, including Internet access.

Resources: The primary resources needed to implement this recommendation are staff commitments from MDE, other state agencies, and educational organizations with a stake in the creation of a MIN.

Success: The establishment of a broad-based user group to facilitate the implementation of a MIN should be in place no later than October 1, 1998. The user group should conduct a review of the MIN Plan by December 31, 1998, then turn its ongoing attention to assisting in the network's realization.

Citations: *Michigan's Five-Year State Technology Plan (1992-1997)*
Michigan Department of Education
http://www.mde.state.mi.us/techplan/

Michigan Information Network Plan (1995)
Michigan Department of Management and Budget
http://www.migov.state.mi.us/min/0-toc.html

MiCTA
http://www.micta.org/

Merit Network, Inc.
http://www.merit.edu/

RECOMMENDATION 11: Technical Standards

Challenge: Network design involves a high degree of technical sophistication and expertise not commonly found in schools and school districts whose primary purpose has been and should continue to be the instruction of students. Educators often lack necessary resources and expertise to design and create voice, video and data networks that will be compatible with statewide communications networks. In some cases, the need for new technologies to be interoperable with existing school systems is overlooked. Also, the state's school building infrastructure is, in many cases, more than 40 years old. Many schools were not designed for the demands of modern technology. School administrators and technology coordinators need reliable information about networking architectures, electrical service demands, cable pathways and equipment closets and the provision of assistive technology. Too often, educators need to rely solely on the vendor community for technical advice and support.

Recommendation: The Michigan Department of Education (MDE) will work cooperatively with other state agencies and interested organizations to identify and disseminate communications standards for voice, video and data networks, plus facilities renovation and construction standards with optimal specifications for the design of technology-rich learning environments.

Rationale and Implementation: The implementation of this recommendation requires a collaborative effort between MDE, the state's Office of the Michigan Information Network (MIN), telecommunication services providers, existing networking entities such as the Merit Network and MiCTA (formerly the Michigan Collegiate Telecommunications Association), architectural firms and educational technology consultants, plus interested educational organizations. A special task force operating under the auspices of the broad-based user group identified in Recommendation 10 should be charged with the responsibility of identifying and disseminating available standards and resources related to the construction and renovation of school facilities and the design of networking infrastructures. An initial effort at identifying standards to which schools could refer was included in the *Final Report of the MIN Planning Committee*, submitted to the Michigan Department of Management and Budget (DMB) in 1995.

Resources: Primary resources needed to implement this recommendation are staff commitments from affected state agencies such as MDE, the Michigan Department of Management and Budget (DMB) and its Office of the MIN, plus interested educational organizations, businesses, telecommunication services providers and other parties. Primary dissemination of eventual standards and guidelines can be accomplished via MDE's web pages (MDEnet), with supplementary distribution in hard copy format.

Success: A set of construction and renovation standards, accompanied by recommended network infrastructure guidelines, should be completed and disseminated by December 31, 1998.

Citations: *Michigan Information Network Plan* (1995)
Michigan Department of Management and Budget
http://www.migov.state.mi.us/min/0-toc.html

Final Report of the MIN Planning Committee (May 1995)
Appendix Three: MIN Technical Committee Report
MIN Planning Committee

RECOMMENDATION 12: Model Technology Plan

Challenge: The importance of schools effectively planning for technology programs has been apparent for many years, but only in 1997 did this activity became a practical mandate. The federal Universal Service Fund (USF) program requires that school districts have state-approved technology plans to be eligible to receive discounts of 20 to 90 percent on many telecommunications services, including Internet access and internal wiring. Many districts have been forced to hastily develop technology plans. They may have to upgrade existing plans and seek state approval to continue participation in the USF program. School districts often lack the onsite expertise to guide them in such a thorough planning exercise.

Recommendation: The Michigan Department of Education (MDE) will establish a model technology plan or identify an existing model plan, including elements necessary for an effective planning process and ease of incorporation into school improvement plans, to serve as a guide and to accelerate the preparation of quality planning documents by local school districts.

Rationale and Implementation: If school districts in Michigan, as well as those nationwide, fail to adopt quality technology plans, key funding initiatives such as the USF program could be jeopardized. The federal Technology Literacy Challenge Fund program also places a premium on applicants having quality technology plans. A model plan prepared or identified, then disseminated by educational interests such as intermediate school districts (ISDs), regional educational media centers (REMCs), colleges and universities, and MDE — the agency which administers many federal technology funding initiatives in the state — would serve as a starting point and guideline for school districts needing assistance. The model plan should address issues such as integrating technology into the curriculum, prioritizing and establishing timelines for technology acquisition, funding technology programs and evaluating the impact of technology investments. Districts using the model plan should tailor it to meet local circumstances and integrate it into the technology component of school and school district improvement plans. A sample technology plan created by the Gratiot-Isabella Regional Educational Service District (RESD) in 1997 may serve as the basis for a model. In addition, model assistive technology plans have been developed by Wayne County RESA and Oakland Schools.

Resources: The Michigan Department of Education may award a small amount from the agency's 1998 allocation in the Technology Literacy Challenge Fund program to implement this recommendation. If the Gratiot-Isabella RESD plan or another existing model can be utilized, the cost to implement this recommendation would be minimized. The expense of disseminating a model plan would be modest if it is distributed electronically.

Success: At least 95 percent of the local school districts, public school academies and nonpublic schools should have quality technology plans in place by December 31, 1998.

Citations: USF Technology Plan Information for Michigan K-12 Schools
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/action/k12.html

Sample Technology Plan (1997)
Gratiot-Isabella RESD
http://remcen.ehhs.cmich.edu/tech_plan/

RECOMMENDATION 13: Technology Appropriation

Challenge: The demand on existing foundation allowances for many school districts under Michigan's School Aid Act far exceeds the dollars available. To identify and isolate funds to improve and implement technology strategies for improving student achievement and district productivity is a time-consuming and often frustrating task. Greater support from the state would help schools leverage investments in the technical and human infrastructures that should lead to increased technological capacity and greater statewide equity of access to technology-assisted learning resources.

Recommendation: The Michigan Legislature should provide an annual appropriation of funds in the state's School Aid Act specifically for the purpose of implementing technology-assisted learning programs, with districts that receive funds being subject to three basic stipulations: 1) districts must have a technology plan that is in compliance with state and federal requirements; 2) districts must supply a matching dollar value from local resources; and 3) districts must demonstrate that real savings gained from participation in the federal Universal Service Fund (USF) program have been reinvested in additional technology, technology upgrades or training, or related expenditures.

Rationale and Implementation: The Governor's Office and the Michigan Legislature must work jointly to establish an annual appropriation under the state's School Aid Act to assist school districts in funding technology-related expenses. This appropriation must take into account the anticipated effect of the Durant settlement on educational technology funding. Without such an appropriation in the School Aid Act, the implementation of local technology programs is likely to continue to be fragmented and concentrated in districts possessing greater local resources. Funding sources other than local district budgets are often restricted to infrastructure, or can require extensive staff input to prepare grant applications — human resources that many districts may not possess. Institutionalizing an annual appropriation for educational technology in the School Aid Act will establish a recurring source of dollars on which school districts can rely. An obligation exists for school districts to identify resources on the local level that can be used as a match for state dollars, as well as demonstrate that they are using savings gained from the USF program for technology-related investments. School districts also must have a technology plan in place to assure that all funds dedicated to educational technology — from state, local or private sources — are spent wisely and can be expected to have a positive effect on student learning.

Resources: Educational interests in Michigan must commit the staff resources necessary to gain legislative support for an annual allocation for educational technology in the School Aid Act. A specific technology-focused expenditure proposal must be developed. Schools must identify sources of matching funds.

Success: Obtaining approval to include an annual appropriation of funds for educational technology in the state's School Aid Act should be accomplished by the close of the current legislative session, December 31, 1998. An actual appropriation of dollars would occur during the subsequent legislative session, to be available during the 1999-2000 school year.

Citation: Universal Service Fund Information Page
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/

RECOMMENDATION 14: Funding Flexibility

Challenge: The existing School Code in Michigan does not permit the expenditure of building and site sinking funds for acquiring end user equipment such as computers and peripheral devices. It does allow for the construction of networks with respect to cabling. This creates the possibility that school districts may wire buildings for network operations, but have no means of activating the network because funding for termination equipment is not available. With respect to bonds, funds may be used by schools for initial purchases, including customized application software, but software upgrades are not acceptable expenditures. The current School Code also prohibits the use of bond proceeds to lease telecommunications services. Such a restriction to a school's choices may prevent the most effective use of limited resources. The potential for technology to benefit education will not be fully realized as long as school districts' ability to finance these advanced products and services is limited.

Recommendation: **Educational interests should work with state and local policymakers to propose and seek approval of legislation that would amend the state's School Code to allow for more flexibility in spending building and site sinking funds, as well as bond funds, for technology-related expenditures.**

Rationale and Implementation: School districts, their representative organizations and interested parties must work with state policymakers to develop and approve legislation to amend the state's School Code. Amending the School Code as recommended — possibly including a provision requiring that school districts have technology plans in compliance with state and federal requirements —would provide another option for schools to fund hardware, software and, in some cases, access fees needed to operate voice, video and data networks used for technology-assisted learning and administrative operations. Currently, the acquisition of end user equipment must come from each district's general fund or from special resources such as grants, bond funds and fundraisers. With the foundation allowance of many districts already severely taxed to provide support for day-to-day operations, significant dollars for the acquisition of computers and peripheral devices may not be available. General fund budgets are strained even further since they must support secondary costs related to technology acquisition, such as maintenance, software and training expenses.

Resources: Commitments are necessary from school districts and interested educational organizations and agencies to develop and advocate on behalf of amending the School Code as proposed.

Success: Legislative approval should be obtained by September 1, 1998, for amendments to the Revised School Code, Public Act No. 291 of 1995. An amendment to Section 380.1212 should include enabling language to expand the scope of the law to include the use of sinking funds for technology equipment. An amendment to Section 380.1351a should allow the use of bond funds for long-term leases for telecommunications services and the acquisition of application software.

Citations: Michigan Revised School Code of 1995,
Part 16 (Section 1212): Boards Of Education, Powers And Duties Generally
gopher://gopher.mde.state.mi.us:70/00/leg/code/16

Michigan Revised School Code of 1995,
Part 17 (Section 1351): Bonds and Notes
gopher://gopher.mde.state.mi.us:70/00/leg/code/17

RECOMMENDATION 15: Collaboration

Challenge: Public and private funding initiatives to assist schools with the acquisition of technology for classroom and administrative uses are placing a greater premium on collaborative endeavors that maximize the positive impact and value of investment for each project. Since 1994, with the dedication by the Michigan Public Service Commission of excess earnings of Ameritech to support educational technology, schools have been increasingly conscious of the need to work with others, including libraries, health care facilities, nonprofit organizations and private businesses. However, this need to collaborate has not yet been fully realized by all educational institutions. Even when educators acknowledge the importance of partnerships, they may only recognize the benefit that they obtain, and not the value that their presence brings to other participants.

Recommendation: Educational institutions should make every effort to maximize the funding support and assistance available from public and private sources by establishing collaborative arrangements with other schools, school districts, colleges, universities, libraries and similar entities to aggregate demand for technology products and services, and where real savings result from participation in initiatives such as the Universal Service Fund (USF) program, these dollars should be designated for additional technology-related investments.

Rationale and Implementation: Schools realize with increasing frequency that some of their demand for technology and telecommunications services — such as Internet access, bandwidth for interactive video programming and even basic telephone service — bears similarity to the needs of colleges, universities, libraries, health care facilities, nonprofit organizations, private businesses, governmental agencies and other schools. Collaborative purchasing and leasing agreements aggregate demand and, consequently, drive down prices. Fiscal efficiencies can be achieved by schools and school districts if they reinvest savings from the federal USF discount program to help extend existing funding for technology, in some cases applying those savings toward activities such as staff training which may not be eligible for support under other funding programs. Basic strategies and decisions regarding technology funding and support by schools and school districts rest with local administrators and governing boards. However, the Michigan Department of Education (MDE) should place a greater emphasis on the need for collaboration — and even the reinvestment of USF savings — in guidelines that the agency prepares for the Technology Literacy Challenge Fund program and other grant projects that it oversees. It should encourage input from the general education community in establishing those guidelines. MDE should utilize the expertise of the State Superintendent's Educational Technology Advisory Group (ETAG) in developing criteria and an increased focus for the administration of the Technology Literacy Challenge Fund program in 1998.

Resources: Leadership and a staff commitment by schools and school districts, and by their potential partners in collaborative projects, are necessary. A commitment of staff is also essential by MDE.

Success: One measure of success is an informal evaluation of the quality of grant applications received by MDE that feature strong partnerships between schools and other entities. In addition, the number of Michigan schools and school districts participating in the USF program should reach 90 percent by December 31, 1998. The reinvestment of USF savings by educational institutions will be more difficult to measure, but could be subject to an independent federal review.

Citations: MPSC Case No. U-8987: Distance Learning Project
Michigan Public Service Commission
http://ermisweb.state.mi.us/mpsc/comm/u-8987.htm

Universal Service Fund Information Page
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/

Approval of 1997-98 Technology Literacy Challenge Grants
Michigan Department of Education/State Board of Education
http://www.mde.state.mi.us/off/ogt/techlitapprv.shtml

RECOMMENDATION 16: Statewide Purchasing and Licensing

Challenge: Inequities in educational opportunity are created when some schools cannot afford licensing fees required for software programs, video titles and online access to electronic resources that provide teachers with instructional tools and students with information necessary for the completion of class projects and assignments. Even those educational institutions budgeting for such expenses find their dollars do not extend nearly as far as those for schools and school districts working cooperatively. Further, educators sometimes have difficulty finding unbiased evaluations of electronic resources to help when making acquisition decisions.

Recommendation: The Michigan Department of Education (MDE) should work in conjunction with intermediate school districts (ISDs), regional educational media centers (REMCs) and other educational organizations to support and expand existing statewide purchasing, licensing and evaluation programs for items such as full-text online data bases, educational software and instructional video programs, and to identify similar resources in the state's library community that may be available to schools at little or no charge.

Rationale and Implementation: The Michigan Department of Education (MDE), with participation from ISDs, REMCs and other educational groups, should review the capabilities of existing statewide purchasing, licensing and evaluation programs to determine the degree to which they could be supplemented or improved. One model of aggregated purchasing for software and related products has been operated by the REMC Association of Michigan since 1972. In 1996, it saved schools and local and intermediate school districts an estimated $16 million. Other models include MiCTA (formerly the Michigan Collegiate Telecommunications Association), plus the "state contract" administered by the Michigan Department of Management and Budget. Electronic resources and services are also available from the state's library community. AccessMichigan is a $2 million project funded by the Library of Michigan and the Michigan Legislature to make online periodical data bases accessible in all libraries and schools in the state. MDE should establish a partnership with the Library of Michigan and designate a liaison to meet regularly with representatives of the library community to keep abreast of resources that may benefit schools, with comparable collaborations encouraged at the regional and local levels.

Resources: Modest staff resources are required by MDE and existing cooperative licensing and purchasing programs to review existing programs and their capabilities, but much more significant is the actual earmarking of funds to purchase or license access to various resources on behalf of all schools and school districts in Michigan. Precedent for such an investment was established by the Legislature with its appropriation of $500,000 to help launch AccessMichigan. Additionally, MDE may dedicate a significant dollar amount from the state's 1998 allocation of federal money under the Technology Literacy Challenge Fund for applications providing statewide access to specific electronic learning resources.

Success: Partial success for this recommendation is determined by the creation of a cooperative effort among MDE and existing purchasing and licensing programs in Michigan to support and expand services to schools and school districts. However, the ability to maximize the success of this proposal will be measured by an infusion of funds that will not only increase services to educational institutions in Michigan, but provide greater and more equitable statewide distribution of electronic learning resources.

Citations:

REMC Association of Michigan
http://isd.ingham.k12.mi.us:80/~remcam/

MiCTA
http://www.micta.org/

AccessMichigan
http://accessmichigan.lib.mi.us/

RECOMMENDATION 17: Advocacy

Challenge: Segments of the general public, including some governmental and educational policymakers, possess limited understanding of the far-reaching evolution in informational technologies and the application of these new technologies to education. Lack of awareness, accompanied by a fear of the unknown, present obstacles to the introduction of technology that can benefit student learning. While many groups and organizations in Michigan, as well as a number of government agencies, have been supportive of incorporating technology into the educational mission, the state has lacked strong champions who are both tireless and vocal in their advocacy.

Recommendation: The Michigan Department of Education (MDE) must step forward to collaborate with — and when necessary marshal and aggregate the energies and resources of — other state agencies, state policymakers, educational organizations and institutions, libraries and businesses to increase public awareness and promote the appropriate use of technology in the learning community.

Rationale and Implementation: Statewide advocates for educational technology can come from within government — from the Governor, the Michigan Legislature or a state agency such as MDE — or from one of Michigan's leading educational organizations, or from a combination of sources including the business community. Advocacy and leadership are best when there are multiple entities serving as champions. Efforts should be nonpartisan.

Resources: Time and travel demands on the leading advocates for educational technology will be significant. Staff resources of MDE and other state agencies are needed in supporting roles. The State Superintendent's Educational Technology Advisory Group (ETAG), featuring representatives of approximately 40 educational organizations in the state, can be a significant force in an advocacy role.

Success: The impact of this recommendation can be measured in two steps: 1) there is a strategic and mutually beneficial alliance formed between MDE and other educational technology stake-holders, with strong advocates emerging from this process; and 2) an action plan is developed to increase the knowledge level and understanding of policymakers and the general public related to the use of technology in the field of education. In addition, the successful implementation of other recommendations in MDE's State Technology Plan will, in part, be a measure of the positive impact of this recommendation.

RECOMMENDATION 18: Public Awareness

Challenge: A lack of knowledge and awareness regarding the potential for technology to benefit student learning and achievement contributes to periodic resistance by parents, businesses, community leaders and even school board members to the funding, implementation and expansion of school instructional technology programs.

Recommendation: Schools must expand support for technology-rich learning environments by creating opportunities that promote awareness of, and increase knowledge about, educational technologies currently being used or to be used by students within their communities.

Rationale and Implementation: School technology programs require widespread understanding and support within a community. The purchase and operation of computers, video cameras and monitors, VCRs and other electronic learning tools and associated software, plus the establishment of local and wide area networks and telecommunications links to distant learning resources, demand substantial investment. Educators cannot afford to allow community members to unconsciously conclude that these technologies do not benefit student learning. A basic understanding of the positive value of technology to education should be sought. Schools can work independently or in conjunction with intermediate school districts (ISDs) and regional educational media centers (REMCs) to stage awareness campaigns and host related activities. Methods of showcasing the value of technology in the learning environment include technology fairs, vendor demonstrations, plus classroom visits by parents, community members and business leaders. Illustrating the use of technology by local businesses will contribute to understanding the significance of technology-assisted learning to student achievement.

Resources: Additional dollars are not required to implement this recommendation, but a periodic commitment of staff time to organize and conduct technology awareness activities is necessary for schools. The Michigan Department of Education (MDE) and leading educational organizations in the state can help local educators by identifying model awareness programs. Dissemination of information could occur electronically, as well as during annual meetings and conferences of organizations such as the Michigan Association for Computer-Related Technology Users in Learning (MACUL), the Michigan Association for Media in Education (MAME) and the Michigan Institute for Educational Management (MIEM).

Success: An initial measurement of success for this recommendation is the amount of interest expressed by schools and school districts in identifying models on which technology awareness programs can be based, with a data base of such models organized by MDE. An indirect measurement is the support given by voters to local funding initiatives that involve a technology component.

Citations: Michigan Association for Computer-related technology Users in Learning
http://www.macul.org/

Michigan Association for Media in Education
http://www.mame.gen.mi.us/

Michigan Institute for Educational Management
http://admin.melg.org/miem/index.html

RECOMMENDATION 19: Administrative Communications

Challenge: Many schools have yet to fully exploit the potential for technology to apply a wide variety of administrative efficiencies to regular management routines and responsibilities. Even fewer schools incorporate technology into school-to-home communications.

Recommendation: Schools, school districts, the Michigan Department of Education (MDE) and other educational institutions should use technology to supplement and enhance existing communications between teachers, administrators, parents and students, to foster greater administrative efficiencies and stronger bonds within the educational community and between schools, parents and the general public.

Rationale and Implementation: Technology can assist educators in carrying out numerous administrative functions such as communications, grading, attendance, course scheduling, and transportation and food service management, especially with the presence of a local area network within a school building and a wide area network linking each school to district offices. Schools generally have the power to establish and increase communications within the school community and between teachers and parents, using voice mail, electronic mail (e-mail), plus district, school and teacher web pages. Cable television access channels provide additional opportunities for community outreach. Staff training and professional development can be enhanced using interactive video technology. MDE should continue to model the use of administrative technologies by offering online access to and submission of grant applications; expanding Web-based solutions for data collection and dissemination; developing an electronic mail notification system for the distribution of emergency, time-sensitive information; creating electronic discussion groups focusing on MDE programs and services; examining options for providing statewide voice and/or video access to state educational policy proceedings; and establishing an interactive videoconferencing facility.

Resources: The impact of this recommendation on staff resources would be modest if all that is needed is leadership and the full utilization of existing technology across the complete range of instructional and administrative applications. However, the cost of increasing basic school technology capabilities by acquiring additional equipment or capacity could be significant. Further, the introduction of new hardware and software is accompanied by a need for staff training.

Success: Key indicators would be improved information sharing between school districts and the MDE, along with a future increase in the use of technology by schools and school districts to create greater administrative efficiencies and to support communications with parents. Unfortunately, no base line data has been collected to which future comparisons can be made, but this will be added to an annual survey of Michigan schools, such as the one conducted by Quality Education Data and the Michigan Department of Education in 1997.

RECOMMENDATION 20: Electronic Learning Community

Challenge: Many recommendations in *Michigan's State Technology Plan (1998)* call for the dissemination of information and a sharing of resources among members of Michigan's educational community, yet electronic communications among educators in the state are fragmented. There exists no single path — a source to which educators can turn on a daily basis — for the equitable delivery of information, utilization of scarce resources and resolution of problems common to all.

Recommendation: A content-based, virtual educational network should be established that incorporates instructional and administrative functions in a statewide electronic learning community that is accessible by all schools in Michigan.

Rationale and Implementation: Content disseminated via an electronic educational network in Michigan would be the shared responsibility of the users. No single organization, agency or other entity would be designated as the manager or sole provider of program content. The concept of an electronic learning community is already being pioneered in the state: the Michigan Statewide Systemic Initiative's Dialogue Web focusing on mathematics and science education; the Michigan Virtual Automotive College helping to train talent for the automotive industry; the M*SAT Online listing of educational teleconferences on the World Wide Web; and the Michigan Department of Education's Michigan Education Information System (MEIS) and Education Data Network (EDN) assisting in data collection and payment processing. The ability to establish this electronic learning community is dependent on the telecommunications infrastructure in Michigan and the individual networks of multiple providers.

Resources: The Michigan Department of Education (MDE), with input from the State Superintendent's Educational Technology Advisory Group (ETAG), must establish a framework for organizing what now are fragmented efforts among educators and state agencies to communicate and share resources. MDE must support efforts to fully activate the Michigan Information Network, the network of networks on which statewide educational communications could occur.

Success: The concept of an electronic statewide learning community will be realized when all schools in the state utilize a common telecommunications infrastructure as a cost-effective way of communicating and sharing information resources and learning opportunities. Educational interests and policymakers should strive to reach this goal by the year 2000.

Citations:

Dialogue Web
Michigan Statewide Systemic Initiative
http://mssi.mde.state.mi.us

Michigan Virtual Automotive College (MVAC)
http://www.mvac.org/

M*SAT Online
http://msat.greatlakes.k12.mi.us/

Michigan Education Information System (MEIS) and
Education Data Network (EDN)
Michigan Department of Education
http://www.mde.state.mi.us/edn-meis/

Michigan Information Network Plan (1995)
http://www.migov.state.mi.us/min/0-toc.html

RECOMMENDATION 21: State Technology Plan

Challenge: A state educational technology plan with a standard life span of three, four or five years cannot remain vital in a rapidly changing environment where technological innovations and instructional applications of technology occur continually. The evolution of technology does not recognize or reflect governmental or educational activity cycles. An outdated plan or outdated recommendations in a plan fail to provide leadership to the state's educational community.

Recommendation: ***Michigan's State Technology Plan (1998)*** **must serve as "a living document" to be reviewed, supplemented and assessed, at minimum, on an annual basis by the State Superintendent's Educational Technology Advisory Group (ETAG), with new policy proposals and proposed modifications of existing policies forwarded to the State Board of Education for consideration.**

Rationale and Implementation: A model for educational policy documents undergoing annual review is included in the Michigan Revised School Code of 1995. Section 1277(1) mandates that local school improvement plans undergo an annual review, while Section 1277(2)(f) addresses methods for effective use of technology by local districts. The actual review and assessment of *Michigan's State Technology Plan (1998)* should be a function of ETAG, with staff assistance from the Michigan Department of Education (MDE). MDE must continue its participation in efforts to collect, update and process base line data, including the maintenance of its *Inventory of Instructional Telecommunications Systems in Michigan*. It is expected that the primary mode of disseminating *Michigan's State Technology Plan (1998)* will be via the World Wide Web, which allows for periodic and convenient updates.

Resource: MDE staff serves a liaison and support role to ETAG. Each of the approximately 40 organizations that are members of ETAG must commit a representative to actively participate in the technology plan review and assessment process.

Success: The completion of an annual review and assessment of *Michigan's State Technology Plan (1998)* is the basic determinant of success. Another primary success indicator, but one less easily measured, is that the *Plan* not only remains a vital policy document assisting schools and other educational institutions in guiding the application of technology in the learning environment, but that it also is recognized as being more relevant and helpful because of the annual review and assessment process. The degree to which schools see the *Plan* as an important, dynamic "living document" could be the focus of a question in an annual survey, such as the one conducted by MDE and Quality Education Data (QED) in 1997.

Citations: Michigan Revised School Code of 1995,
Part 16 (Section 1277): Boards Of Education, Powers And Duties Generally
gopher://gopher.mde.state.mi.us:70/00/leg/code/16

Inventory of Instructional Telecommunications Systems in Michigan (1996)
Michigan Department of Education
http://www.mde.state.mi.us/reports/inventory/

Appendices

APPENDIX A:

Membership: State Superintendent's Educational Technology Advisory Group (ETAG)

Chair:

Paul Hunt, Vice Provost
Libraries, Computing and Technology
Michigan State University
http://www.msu.edu/

Participants: * Committee co-chairs

Burton Brooks
Coalition of Michigan Subject
Matter Organizations

Neil Skov
Council for Preservice Technology
http://www.macomb.k12.mi.us/cpt/CPT.htm

James Greene
Educational Teleconsortium of Michigan
http://www.kirtland.cc.mi.us/etom/

Jeff Bush
Learning Institute for Technology Education
http://www.remc8.k12.mi.us/teched/

Mark Deschaine
Michigan Association for Administration
of Special Education

Ric Wiltse* and Jo Ellen Miskowski
Michigan Association for Computer-related
technology Users in Learning
http://www.macul.org

Pete Finney
Michigan Association for Distance Learning
http://www.voyager.net/madl

Ruth Lumpkins
Michigan Association for Media in Education
http://www.mame.gen.mi.us

George Grimes
Michigan Association for Supervision and
Curriculum Development
http://www.ascd.org/cr/affiliat/miascd/mascd.html

Mary Marcil
Michigan Association of Community and
Adult Education

Roger LaBonte
Michigan Association of Intermediate School
Administrators

Johanna Brown
Michigan Association of Math/Science Centers
http://www.mscenters.org
Michigan Science Teachers Association
http://www.msta-mich.org

Mark Gribben
Michigan Association of Nonpublic Schools

James Goenner
Michigan Association of Public School Academies
http://www.charterschools.org/

Dan Wertz
Michigan Association of School Administrators
http://www.melg.org/masa/index.html

Jeff Stoney
Michigan Association of School Boards
http://www.masb.com

Judy Raica and Douglas McCall
Michigan Association of Secondary School Principals
http://www.melg.org/MASSP/index.html

James M. Sandy
Michigan State Chamber of Commerce
http://www.michamber.com/

Michael Wahl*
Michigan Community College Association
http://www.mcca.org/

Paul Roltsch
Michigan Congress of Parents, Teachers and Students
http://www.michiganpta.org/

Ken Mareski
Michigan Council for the Social Studies

Fred Barton*
Michigan Council of Teachers of English
http://pilot.msu.edu/user/mcte/mcte.html

Steve Frank and Bruce Budzynski
Michigan Council of Teachers of Mathematics

Gene Niedzwiecki
Michigan Council of Vocational Administrators

JaMille Jackson
Michigan Education Association
http://www.mea.org/

Peggy O'Keeffe
Michigan Elementary and Middle School
Principals Association
http://www.memspa.org/

David Frankel*
Michigan Federation of Teachers

Ron Lutz
Michigan Industrial Technology Education Society
http://www.Macomb.K12.Mi.US/romeo/index.htm

Jean Tabor*
Michigan Library Association
http://www.mla.lib.mi.us

Gary Light
Michigan Manufacturers Association
http://www.mma-net.org/

Jeff Flynn
Michigan Reading Association
http://www.iserv.net/~mraread/

Margaret Clinton*
Michigan School Business Officials
http://www.melg.org/msbo/msbopg1.htm

Blaine Morrow*
Middle Cities Education Association
http://admin.melg.org/mcea/

Thomas Juett
Regional Educational Media Centers
Association of Michigan
http://isd.ingham.k12.mi.us:80/~remcam/

Kathleen Gillespie and Ann Parker
Small Business Association of Michigan
http://www.sbam.org

James Bosco
Tech Corps Michigan
http://www.oet.wmich/techcorps/

Affiliates:

Gregory Marks and Jeff Ogden
Merit Network, Inc.
http://www.merit.edu/

Kenneth Johnson and Gary Green
Michigan Collegiate Telecommunications Association
http://www.micta.org/

Jack Christensen and Sharon Winkler
Michigan Information Technology Network
http://www.mitn.msu.edu

Invited Resource Persons:

Cynthia Cockrel*
Detroit Public Schools
http://dpsnet.detpub.k12.mi.us

Jesse Luttenton*
Upper Great Lakes Educational Technologies, Inc.
http://www.greatlakes.k12.mi.us/partners/ugleti/

Dorothy Riley, Milken Award
Higgins Elementary School, Detroit
http://www.detpub.k12.mi.us/html/home162.htm

Jack Thompson
REMC 22 and Eastern Upper Peninsula ISD
http://eup.k12.mi.us/

Deborah Woodman, Milken Award
Lansing School District

Ex Officio Members:

Robert Filka
Michigan Jobs Commission
http://www.michigan.state.mi.us/mjc/

Linda Schatz
Michigan Information Network

Michigan Department of Education Staff:

Michigan Department of Education
http://www.mde.state.mi.us

Jamey Fitzpatrick, Director
Data and Technology Services

Paul Bielawski, Supervisor
Curriculum Development Program

James LeVande, Consultant
Technology Education
Career and Technical Education Services

Sue Wittick, Consultant
Professional Preparation Services

Mark Floros
Information Systems Support Technician
Data and Technology Services

David Bazzett
Information Systems Analyst
Data and Technology Services

Operational Staff:

James Wiljanen, Consultant
State Technology Plan Project
http://www.mde.state.mi.us/tplan/

Robert Kosanovich, Consultant
Michigan Statewide Systemic Initiative
http://mssi.mde.state.mi.us

APPENDIX B:

Citations and Additional Material

RECOMMENDATION 1: The State Board of Education (SBE), working in conjunction with the Governor's Office, the Michigan Legislature and broad educational interests in the state, should examine issues regarding access to technology-delivered learning opportunities and resources for all students, then develop and support policies which promote and improve equity.

Recommendation Citations:

None

Additional Material of Interest:

Critical Issue: Ensuring Equitable Use of Education Technology (1997)
North Central Regional Educational Laboratory
http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te400.htm

Equitable Access (7); *Report to the President on the Use of Technology to Strengthen K-12 Education in the United States* (March 1997)
President's Committee of Advisors on Science and Technology, Panel on Educational Technology
http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/PCAST/k-12ed.html

Computers and Classrooms: The Status of Technology in U.S. Schools (1997)
Educational Testing Service
http://www.ets.org/research/pic/compclass.html

Ensuring Equity; *The Learning Connection: Schools in the Information Age* (1997)
The Benton Foundation
http://www.benton.org/Library/Schools/two.html#equity

A United Vision: Technology for All Americans, Richard E. Satchwell and William E. Dugger, Jr.
Journal of Technology Education, Vol. 7, No. 2, Spring 1996
http://scholar.lib.vt.edu/ejournals/JTE/jte-v7n2/satchwell.jte-v7n2.html

Technology for All Americans Project
International Technology Education Association
http://scholar.lib.vt.edu/TAA/TAA.html

Equity; *Master Plan for Education Technology* (1996 Update)
Office Of Education Technology, Kentucky Department of Education
http://www.kde.state.ky.us/edtech/curr_mp1.html#equity

North Carolina Instructional Technology Plan (1995)
North Carolina School Technology Commission
http://www.dpi.state.nc.us/Tech.Plan/TOC.html

RECOMMENDATION 2: The core curriculum of each school should address the use of technology as an integral part of student learning in each content area, including specific technology knowledge and skills needed by students. Technology should be addressed in a school assessment plan to evaluate learning about technology and the use of technology to enhance learning.

Recommendation Citations:

Instructional Technology Across the Curriculum (ITAC)
Draft K-12 Instructional Technology Standards
http://cdp.mde.state.mi.us/itac/Page1.html

Additional Material of Interest:

Technology for All Americans Project
International Technology Education Association
http://scholar.lib.vt.edu/TAA/TAA.html

Best Practices in Educational Technology (1997)
Best Practices in Education (BPE)
http://www.bestpraceduc.org/Technology/index.shtml

Computers and Education in Action: Some Examples (1997)
EdWeb: Exploring Technology and School Reform, Andy Carvin
http://edweb.gsn.org/stories.intro.html

Learning Exchange for Teachers and Students (LETSnet)
Michigan State University
http://commtechlab.msu.edu/sites/letsnet/

Position Paper: *The Use of Technology in the Learning and Teaching of Mathematics* (1994)
National Council of Teachers of Mathematics
http://www.nctm.org/ns-search/organization/general.information/Position.Statement.13.htm?NS-search-set=/348c6/aaaa000rj8c658a&NS-doc-offset=1&

Alaska 2000 Technology Standards (1995)
Alaska Department of Education
http://ivaldi.jun.alaska.edu/edtech/statewide.html

Technology Standards; *Academic Standards* (1997)
Arizona Department of Education
http://ade.state.az.us/standards/finaltec.html

Model Information Literacy Guidelines (1994)
Colorado Department of Education and Colorado Educational Media Association
http://www.cde.state.co.us/ftpcde.htm#guidelines

Position Paper on Information Processing Skills (1992), Developing Lesson Plans and Sample Lessons A-G (1994), Scope and Sequence Planning and Integration Matrix (1994)
Michigan Department of Education/State Board of Education
http://www.mde.state.mi.us/cgi-bin/gf/tech/position

A Compendium of Standards and Benchmarks for K-12 Education (1997)
John S. Kendall and Robert J. Marzano, Mid-continent Regional Educational Laboratory (McREL)
http://www.mcrel.org/standards-benchmarks/index.html

Mathematics, Science, and Technology; *State Learning Standards* (1995-1996)
New York State Department of Education
http://www.cnyric.org/standards/mst/mst.html

Computer Skills Curriculum
North Carolina Department of Public Instruction
http://www.dpi.state.nc.us/Curriculum/Computer.skills/compcurr.html

Integrated Curriculum; *Priority Academic Student Skills* (1997)
Oklahoma State Department of Education
http://www.sde.state.ok.us/lib/pass/passindx.html

Guideline for District Technology Skills for Students
Oregon Department of Education
http://www.oetc.org/guide/gdlnind.html

Science & Technology Curriculum Framework (1996)
Massachusetts Department of Education
http://info.doe.mass.edu/doedocs/frameworks/sciencetoc.html

Technology Across the Curriculum (1996)
Virginia Department of Education
http://teach.virginia.edu/go/tac/

Chapter 123: *Texas Essential Knowledge and Skills for Technology Education/Industrial Technology Education* (1997)
Texas Education Agency
http://www.tea.state.tx.us/teks/123toc.htm

Michigan Center for Career and Technical Education (MCCTE)
http://mccte.educ.msu.edu

Technology Education Curriculum Guide
Office of Career and Technical Education, MDE. 1997

RECOMMENDATION 3: Schools should partner with businesses, community colleges, universities and community organizations to assist in keeping the local school community, including teachers and students, aware of expectations demanding that graduates of the K-12 system have specific technological skills to successfully compete in the job market or to perform in postsecondary educational environments.

Recommendation Citations:

Michigan Center for Career and Technical Education (MCCTE), School-To-Work Program
http://mccte.educ.msu.edu/STW/

Michigan's School-To-Work (STW) Network, Michigan Employment Security Agency
http://im.tcimet.net/STW/Pdocs/STW-Welcome.cfm

Additional Material of Interest:

Information Literacy Standards for Student Learning (Draft #5, October 7, 1996)
American Association of School Librarians/Association for Educational Communications and Technology
National Guidelines Vision Committee of the American Library Association
http://www.ala.org/aasl/stndsdrft5.html

Technology Literacy for the Nation and for Its Citizens, Lajeane G. Thomas and Donald G. Knezek
International Society for Technology in Education (ISTE)
http://www.iste.org/publish/whitepaper.htm

Planning Guide for Career Preparation
Office of Career and Technical Education, MDE. 1997

RECOMMENDATION 4: Ongoing training opportunities that build the general level of technology expertise of educators throughout Michigan must be significantly expanded.

Recommendation Citations:

SupportNet, Merit Network, Inc.
http://www.merit.edu/k12.michigan/supportnet/

Additional Material of Interest:

Choosing and Using Technology: Professional Development
Master Plan for Education Technology (1996 Update)
Office Of Education Technology, Kentucky Department Of Education
http://www.kde.state.ky.us/edtech/curr_mp1.html#choosing

Moving from Boxes and Wires to 21st Century Teaching, Kathleen Fulton
T.H.E. Journal (November 1996)
http://www.thejournal.com/special/1196pdfeat1.html

New Teachers: Unplugged, Joye Mercer Barksdale
Electronic Learning (1997)
http://place.scholastic.com/el/exclusive/ex496.htm

Executive Summary, *North Carolina Instructional Technology Plan* (1995)
North Carolina School Technology Commission
http://www.dpi.state.nc.us/Tech.Plan/Executive.Summary.html

Professional Development; *Educate Indiana Technology Plan* (1996)
Indiana Department of Education
http://doe.state.in.us/olr/stplan

RECOMMENDATION 5: Each school district should dedicate, on a recurring basis, a specific and significant portion of its technology budget for ongoing staff training to assist with the effective and efficient use of instructional technology.

Recommendation Citations:

ProjectEdTech (1996-97): Michigan: State Tech Survey Report
Quality Education Data (Denver, CO) and Michigan Department of Education
http://www.mde.state.mi.us/tplan/qed.shtml

Teachers and Technology: Making the Connection (1995)
U.S. Office of Technology Assessment
http://www.ota.nap.edu/pdf/data/1995/9541.PDF

Universal Service Fund Information Page
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/

Long-Range Plan for Technology (1996-2010), Texas Education Agency
http://www.tea.state.tx.us/technology/lrpt/eduprep.pdf

ASTD's Benchmarking Forum: Training Expenditures by Course Type (1996).
American Society for Training and Development
http://www.astd.org/who/research/benchmar/b-stats.htm

Additional Material of Interest:

Supporting Professional Development for Teachers; *The Learning Connection: Schools in the Information Age* (1997)
The Benton Foundation
http://www.benton.org/Library/Schools/two.html#pd

What Will It Cost?; *The Future of Information Technology in Education* (1997), Dave Moursand
International Society for Technology in Education (ISTE)
http://www.iste.org/publish/future/Chapter9.html#5

RECOMMENDATION 6: The State Board of Education and leading educational organizations in Michigan must reiterate the importance of new teachers having the ability to use information technologies to enhance teaching and learning. School districts must be encouraged to include technological competency as an aspect of teacher hiring and evaluation.

Recommendation Citations:

ProjectEdTech (1996-97): Michigan: State Tech Survey Report
Quality Education Data (Denver, CO) and Michigan Department of Education
http://www.mde.state.mi.us/tplan/qed.shtml

Proposed Seventh Standard, Entry-Level Standards for Michigan Teachers
Ad Hoc Referent Committee for Preservice Technology, Michigan Department of Education
http://www.mde.state.mi.us/tplan/presrvtech/index.shtml

Technology and the New Professional Teacher: *Preparing for the 21st Century Classroom* (1997)
National Council for Accreditation of Teacher Education (NCATE)
http://www.ncate.org/specfoc/techrpt.html

Additional Material of Interest:

Infusing Technology into Preservice Teacher Education (Digest #94-6)
ERIC Clearinghouse on Teaching and Teacher Education
http://www.ericsp.org/news3.html

National Standards for Technology in Teacher Preparation (1997)
International Society for Technology Education (ISTE)
http://www.iste.org/specproj/standards/standard.htm

RECOMMENDATION 7: The Michigan Department of Education (MDE) should work with local and intermediate school districts (ISDs), regional educational media centers (REMCs), colleges and universities, libraries and educational organizations to create an electronic, statewide clearinghouse intended for the discovery and exchange of "best practices" in technology-centered learning, teaching and educational administration.

Recommendation Citations:

Dialogue Web
Michigan Statewide Systemic Initiative
http://mssi.mde.state.mi.us

Michigan's State Technology Planning Page
Michigan Department of Education
http://www.mde.state.mi.us/tplan/

Explorer Resource Library
Wayne County Regional Educational Service Agency
http://www.greatlakes.k12.mi.us/

Michigan Electronic Library
http://mel.lib.mi.us/

Universal Service Fund Information Page
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/

Additional Material of Interest:

AskERIC (Educational Resources Information Center)
http://ericir.syr.edu/

The Primary Sources Network
http://primarysources.msu.edu

North Central Regional Educational Laboratory (NCREL)
http://www.ncrel.org/index.html

Technology Connections
Mid-continent Regional Educational Lab (McREL)
http://www.mcrel.org/connect/tech/index.html

U.S. Department of Education Publications
http://www.ed.gov/pubs/index.html

Making Technology Happen: Best Practices and Policies from Exemplary K-12 Schools (1997)
Southern Technology Council
http://www.southern.org/edtech.htm

Best Practices in Education: Communications in the Public Interest (1997)
Benton Foundation
http://www.benton.org/Practice/Edu/

From Now On: The Educational Technology Journal
http://fromnowon.org/

Best Practice: New Standards for Teaching & Learning in America's Schools (1996)
Steven Zemelman, Arthur A. Hyde, Harvey Daniels.

KickStart Initiative
http://www.benton.org/Library/KickStart/kick.showcasing.html

Best Practices Database
Lower Hudson Regional Information Center
http://www.lhric.org/best.htm

SuccessLink: Linking Educational Innovations Across Missouri
http://www.successlink.org/

21st Century Learning Initiative
http://www.21learn.org/index.html

Eisenhower National Clearinghouse for Mathematics and Science Education
http://www.enc.org/index.htm

The Global Schoolhouse: The Well Connected Educator
http://www.gsh.org/wce/

RECOMMENDATION 8: The Michigan Department of Education (MDE) should work in collaboration with local and intermediate school districts (ISDs), regional educational media centers (REMCs), professional educational organizations and accrediting agencies to recommend voluntary professional and technical staffing guidelines needed to maintain effective educational technology programs in schools and school districts, and in regional K-12 service agencies such as ISDs and REMCs.

Recommendation Citations:

ProjectEdTech (1996-97): Michigan: State Tech Survey Report
Quality Education Data (Denver, CO) and Michigan Department of Education
http://www.mde.state.mi.us/tplan/qed.shtml

K-12 Network Technology Planning Guide (1995)
Network Support (Chapter 8)
California Department of Education
http://www.cde.ca.gov/ftpbranch/retdiv/k12/ntpg/ch08.html

Alabama Technology Plan for K-12 Education (1996)
Implementation Phases and Steps (Section 4.2)
Governor's Council on Education Technology
http://www.alsde.edu/techinit/techplan.htm

Additional Material of Interest:

Guidelines for Library Media Center Resources in Michigan Schools (1995)
Michigan Department of Education

RECOMMENDATION 9: School districts should identify and utilize individuals in their local and school communities who have expertise in the use of appropriate technologies and the ability to work with teachers, staff, administrators, parents and students to increase the efficiency and effectiveness with which technology is applied in the learning environment.

Recommendation Citations:

Master Plan for Education Technology (1996 Update)
Office Of Education Technology, Kentucky Department Of Education
Student Technology Leadership Program
http://www.kde.state.ky.us/edtech/curr_mp1.html#student

Computers and Classrooms: The Status of Technology in U.S. Schools (1997)
Educational Testing Service
http://www.ets.org/research/pic/compclass.html
Chapter 2: Student Use of Computers
ftp://etsis1.ets.org/pub/res/cc-chap2.pdf

Tech Corps Michigan
http://www.merit.edu/~mi-corps/

Additional Material of Interest:

None

RECOMMENDATION 10: The Michigan Department of Education (MDE) will work cooperatively with state agencies, educational organizations and others to assist in the establishment of a broad-based user group which will address issues related to and formulate strategies to deal with: 1) coordination among local and regional initiatives to build statewide networking capability; 2) equitable access to and affordable costs for high-quality telecommunications services throughout Michigan; 3) technical standards and network operating protocols; 4) support and technical assistance to ensure quality statewide network operations; and 5) financial resources and purchasing programs to benefit educational technology initiatives.

Recommendation Citations:

Michigan's Five-Year State Technology Plan (1992-1997)
Michigan Department of Education
http://www.mde.state.mi.us/techplan/

Michigan Information Network Plan (1995)
Michigan Department of Management and Budget
http://www.migov.state.mi.us/min/0-toc.html

MiCTA
http://www.micta.org/

Merit Network, Inc.
http://www.merit.edu/

Additional Material of Interest:

The K-12 Technology Handbook (1997)
Virginia Department of Education
http://www.pen.k12.va.us/go/VDOE/Technology/Tech_Handbook/toc.shtml

RECOMMENDATION 11: The Michigan Department of Education (MDE) will work cooperatively with other state agencies and interested organizations to identify and disseminate communications standards for voice, video and data networks, plus facilities renovation and construction standards with optimal specifications for the design of technology-rich learning environments.

Recommendation Citations:

Michigan Information Network Plan (1995)
Michigan Department of Management and Budget
http://www.migov.state.mi.us/min/0-toc.html

Final Report of the MIN Planning Committee (1995)
Appendix Three: MIN Technical Committee Report
MIN Planning Committee

Additional Material of Interest:

None

RECOMMENDATION 12: The Michigan Department of Education (MDE) will establish a model technology plan or identify an existing model plan, including elements necessary for an effective planning process and ease of incorporation into school improvement plans, to serve as a guide and to accelerate the preparation of quality planning documents by local school districts.

Recommendation Citations:

USF Technology Plan Information for Michigan K-12 Schools
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/action/k12.html

Sample Technology Plan (1997)
Gratiot-Isabella RESD
http://remcen.ehhs.cmich.edu/tech_plan/

Additional Material of Interest:

Critical Issue: Developing a School or District Technology Plan
Pathways to School Improvement (1996)
North Central Regional Educational Laboratory
http://www.ncrel.org/sdrs/areas/issues/methods/technlgy/te300.htm

North Central Regional Technology in Education Consortia (NCRTEC)
Guiding Questions for Technology Planning (1997)
http://www.ncrtec.org/capacity/guidewww/gqhome.htm

Guidebook for Developing an Effective Instructional Technology Plan (Version 2.0, 1996)
Mississippi State University and National Center for Technology Planning
http://www2.msstate.edu/~lsa1/nctp/Guidebook.pdf

George Lucas Educational Foundation
http://www.glef.org/welcome.html

RECOMMENDATION 13: The Michigan Legislature should provide an annual appropriation of funds in the state's School Aid Act specifically for the purpose of implementing technology-assisted learning programs, with districts that receive funds being subject to three basic stipulations: 1) districts must have a technology plan that is in compliance with state and federal requirements; 2) districts must supply a matching dollar value from local resources; and 3) districts must demonstrate that real savings gained from participation in the federal Universal Service Fund (USF) program have been reinvested in additional technology, technology upgrades or training, or related expenditures.

Recommendation Citations:

Universal Service Fund Information Page
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/

Additional Material of Interest:

None

RECOMMENDATION 14: Educational interests should work with state and local policymakers to propose and seek approval of legislation that would amend the state's School Code to allow for more flexibility in spending building and site sinking funds, as well as bond funds, for technology-related expenditures.

Recommendation Citations:

Michigan Revised School Code of 1995, Part 16 (Section 1212): Boards Of Education, Powers And Duties Generally
gopher://gopher.mde.state.mi.us:70/00/leg/code/16

Michigan Revised School Code of 1995, Part 17 (Section 1351): Bonds and Notes
gopher://gopher.mde.state.mi.us:70/00/leg/code/17

Additional Material of Interest:

None

RECOMMENDATION 15: Educational institutions should make every effort to maximize the funding support and assistance available from public and private sources by establishing collaborative arrangements with other schools, school districts, colleges, universities, libraries and similar entities to aggregate demand for technology products and services, and where real savings result from participation in initiatives such as the Universal Service Fund (USF) program, these dollars should be designated for additional technology-related investments.

Recommendation Citations:

MPSC Case No. U-8987: Distance Learning Project
Michigan Public Service Commission
http://ermisweb.state.mi.us/mpsc/comm/u-8987.htm

Universal Service Fund Information Page
Merit Network, Inc.
http://www.merit.edu/k12.michigan/usf/

Approval of 1997-98 Technology Literacy Challenge Grants
Michigan Department of Education/State Board of Education
http://www.mde.state.mi.us/off/ogt/techlitapprv.shtml

Additional Material of Interest:

The Art of the Deal - No Trump!
From Now On (September 1991)
http://fromnowon.org/fnosept91.html

Integrating Technology in Schools: Administrators Promote Ideas to Businesses (1996)
Software Publishers Association
http://www.spa.org/project/edu_pub/etpgbus.htm

Wired Village: In Rural Virginia, a Community Connects its Citizens and Schools, Lars Kongshem
Electronic School (September 1997)
http://www.electronic-school.com/0997f1.html

RECOMMENDATION 16: The Michigan Department of Education (MDE) should work in conjunction with intermediate school districts (ISDs), regional educational media centers (REMCs) and other educational organizations to support and expand existing statewide purchasing, licensing and evaluation programs for items such as full-text online data bases, educational software and instructional video programs, and to identify similar resources in the state's library community that may be available to schools at little or no charge.

Recommendation Citations:

REMC Association of Michigan
http://isd.ingham.k12.mi.us:80/~remcam/

MiCTA
http://www.micta.org/

AccessMichigan
http://accessmichigan.lib.mi.us/

Additional Material of Interest:

None

RECOMMENDATION 17: The Michigan Department of Education (MDE) must step forward to collaborate with — and when necessary marshal and aggregate the energies and resources of — other state agencies, state policymakers, educational organizations and institutions, libraries and businesses to increase public awareness and promote the appropriate use of technology in the learning community.

Recommendation Citations:

None

Additional Material of Interest:

None

RECOMMENDATION 18: Schools must expand support for technology-rich learning environments by creating opportunities that promote awareness of, and increase knowledge about, educational technologies currently being used or to be used by students within their communities.

Recommendation Citations:

Michigan Associated for Computer-related technology Users in Learning
http://www.macul.org/

Michigan Association for Media in Education
http://www.mame.gen.mi.us/

Michigan Institute for Educational Management
http://admin.melg.org/miem/index.html

Additional Material of Interest:

None

RECOMMENDATION 19: Schools, school districts, the Michigan Department of Education (MDE) and other educational institutions should use technology to supplement and enhance existing communications between teachers, administrators, parents and students, to foster greater administrative efficiencies and stronger bonds within the educational community and between schools, parents and the general public.

Recommendation Citations:

None

Additional Material of Interest:

None

RECOMMENDATION 20: A content-based, virtual educational network should be established that incorporates instructional and administrative functions in a statewide electronic learning community that is accessible by all schools in Michigan.

Recommendation Citations:

Dialogue Web
Michigan Statewide Systemic Initiative
http://mssi.mde.state.mi.us

Michigan Virtual Automotive College (MVAC)
http://www.mvac.org/

M*SAT Online
http://msat.greatlakes.k12.mi.us/

Michigan Education Information System (MEIS) and Educational Data Network (EDN)
Michigan Department of Education
http://www.mde.state.mi.us/edn-meis/

Michigan Information Network Plan (1995)
http://www.migov.state.mi.us/min/0-toc.html

Additional Material of Interest:

None

RECOMMENDATION 21: ***Michigan's State Technology Plan (1998)*** **must serve as "a living document" to be reviewed, supplemented and assessed, at minimum, on an annual basis by the State Superintendent's Educational Technology Advisory Group (ETAG), with new policy proposals and proposed modifications of existing policies forwarded to the State Board of Education for consideration.**

Recommendation Citations:

Michigan Revised School Code of 1995, Part 16 (Section 1277): Boards Of Education, Powers And Duties Generally
gopher://gopher.mde.state.mi.us:70/00/leg/code/16

Inventory of Instructional Telecommunications Systems in Michigan (1996)
Michigan Department of Education
http://www.mde.state.mi.us/reports/inventory/

Additional Material of Interest:

None

OTHER SOURCES NOT LISTED ELSEWHERE IN APPENDIX B

Government Agencies:

MDEnet
Michigan Department of Education
http://www.mde.state.mi.us/

U.S. Department of Education
http://www.ed.gov/

LearnNet
Federal Communications Commission (FCC)
http://www.fcc.gov/learnnet/

Reports, Studies and Surveys:

America's Technology Literacy Challenge
The President's Educational Technology Initiative
http://www.whitehouse.gov/WH/EOP/OP/html/edtech/html/edtech.html

Report to the President on the Use of Technology to Strengthen K-12 Education in the United States (March 1997)
President's Committee of Advisors on Science and Technology, Panel on Educational Technology
http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/PCAST/k-12ed.html

Report '97
CEO Forum on Education and Technology
http://www.ceoforum.org/

Plugging In: Choosing and Using Educational Technology (1995)
North Central Regional Educational Laboratory (NCREL)
http://www.ncrel.org/sdrs/edtalk/toc.htm

Few U.S. Schools Use Technology Well, 2 Studies Report
Education Week on the Web **(10/15/97)**
http://www.edweek.org/ew/vol-17/07tech.h17

ACOT Research, Apple Classrooms of Tomorrow
http://www.research.apple.com/go/acot/ACOTResearch.html#anchor25466881

Fostering the Use of Educational Technology: Elements of a National Strategy (1996)
Thomas K. Glennan and Arthur Melmed (RAND)
http://www.rand.org/publications/MR/MR682/contents.html

Advanced Telecommunications in U.S. Public Elementary and Secondary Schools (Fall 1996)
National Center for Education Statistics
http://www.nces.ed.gov/pubs/97944.html

Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge (1996)
U.S. Department of Education
http://www.ed.gov/Technology/Plan/NatTechPlan

Using Technology to Support Education Reform (September 1993)
U.S. Department of Education (SRI International and Education Development Corporation)
http://www.ed.gov/pubs/EdReformStudies/TechReforms/

Key Points Summary: *National Survey on Schools and Technology* (1996)
National School Boards Association
http://www.nsba.org/itte/polling.html

AAROn States Survey (1997)
Affordable Access, Rural Online (AAROn)
http://www.itc.org/aaron/states/index.html

Teachers Overwhelmingly Favor Internet in Classrooms (1996)
The Well Connected Educator
http://www.gsh.org/wce/heller2.htm

Publications and Articles:

Taking Technology's Measure, Andrew Trotter
Education Week on the Web (November 10, 1997)
http://www.edweek.org/sreports/tc/intros/in-n.htm

Reform and Tomorrow's Schools, Marvin Cetron
Technos Quarterly (Spring 1997)
http://www.ait.net/journal/volume6/1cetron.htm

The Future of Information Technology in Education (1997), Dave Moursand
International Society for Technology in Education (ISTE)
http://www.iste.org/publish/future/Contents.html

Electronic Learning
http://scholastic.com/EL/home.htm

Virginia to Issue Students Free Calculators, Victoria Benning
Washington Post (November 26, 1997)
http://search.washingtonpost.com/wp-srv/WPlate/1997-11/26/046l-112697-idx.html

Specific Issues: Impact of Technology on Learning

The Impact of Technology (1997)
Mid-continent Regional Educational Laboratory (McREL)
http://www.mcrel.org/connect/tech/impact.html

Technology's Impact: A New Study Shows the Effectiveness — and the Limitations — of School Technology, Richard J. Coley
Electronic School (September 1997)
http://www.electronic-school.com/0997f3.html

The Role of Online Communications in Schools: A National Study (1996)
Center for Applied Special Technology (CAST)
http://www.cast.org/stsstudy.html

Recent Research on the Effects of Technology on Teaching and Learning, John Cradler and Elizabeth Bridgforth WestEd
http://www.fwl.org/techpolicy/research.html

Beyond Bells and Whistles: How to Use Technology to Improve Student Learning (1996)
American Association of School Administrators

Specific Issues: Classroom Resources

National Archives and Records Administration: The Digital Classroom
http://www.nara.gov/education/

Specific Issues: Acceptable Use, Copyright and Fair Use Policies

Critiquing Acceptable Use Policies (1995), Dave Kinnaman
http://www.io.com/%7Ekinnaman/aupessay.html

Acceptable Use Policies
Rice University
http://www.rice.edu/armadillo/acceptable.html

Developing a School or District "Acceptable Use Policy" for Student and Staff Access to the Internet (1994),
Clancy J. Wolf
gopher://inspire.ospi.wednet.edu:70/00/Accept_Use_Policies/IN_policies.txt

Internet Safety (1997)
Mid-continent Regional Educational Laboratory (McREL)
http://www.mcrel.org/connect/tech/safety.html

Child Safety on the Information Superhighway, Larry Magid
http://www.4j.lane.edu/InternetResources/Safety/Safety.html

Copyright and Fair Use
Stanford University Libraries
http://fairuse.stanford.edu/

Specific Issues: Health and Safety

Health and Safety; Students with Special Needs
Considerations in Information Technology Education
British Columbia Ministry of Education, Skills and Training
http://www.est.gov.bc.ca/curriculum/irps/itk7/itcons.htm

Specific Issues: Internet Access for Children

Parents Guide to the Internet (November 1997)
U.S. Department of Education
http://www.ed.gov/pubs/parents/internet/

Statement on Library Use of Filtering Software (July 1,1997)
American Library Association/Intellectual Freedom Committee
http://www.ala.org/alaorg/oif/filt_stm.html

Filtering the Internet in K-12 Schools and Libraries (1997)
Librarians Information Online Network (LION)
http://www.libertynet.org/~lion/filtering.html

The CDA Is Dead. How Come I'm Not Happy?, Jake Kirchner
PC Magazine (September 9, 1997)
http://www8.zdnet.com/pcmag/issues/1615/pcmg0082.htm

A Family Friendly Internet (July 1997)
President Clinton and Vice President Gore
http://www.whitehouse.gov/WH/New/Ratings/

Parent's Guide to the Information Superhighway and *Children and the Information Superhighway*
The Children's Partnership
http://www.childrenspartnership.org/

Parental Empowerment (1996)
Project OPEN
http://www.isa.net/project-open/empower.html

A Parent's Guide to Supervising a Child's Online and Internet Experience (1997), Robert Cannon
http://www.cais.net/cannon/memos/parents.htm

Internet Online Summit: Focus On Children
http://www.kidsonline.org

Specific Issues: Gender and Racial Equity

Closing the Equity Gap in Technology Access and Use: A Practical Guide for K-12 Educators (1996)
Center for National Origin, Race and Sex Equity and Northwest Educational Technology Consortium
http://www.netc.org/equity/

Achieving Technological Equity and Equal Access to the Learning Tools of the 21st Century,
Curman L. Gaines, Willie Johnson and D. Thomas King, Saint Paul Public Schools (MN)
T.H.E. Journal (June 1996)
http://www.thejournal.com/past/june/66gain.html

GenTech
University of British Columbia and Simon Fraser University
http://www.educ.sfu.ca/gentech/index.htm

Rural and Urban Images: Voices of Girls in Science, Mathematics, and Technology
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Data and Technology Services
Post Office Box 30008
Lansing, Michigan 48909
(517) 373-6331